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Using Social Cognitive Theory to Model Health Behaviors Among Chinese Children

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USING SOCIAL COGNITIVE THEORY TO MODEL HEALTH BEHAVIORS AMONG CHINESE CHILDREN

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ABSTRACT

USING SOCIAL COGNITIVE THEORY TO MODEL HEALTH BEHAVIORS AMONG CHINESE CHILDREN

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This study examined the usefulness of Social Cognitive Theory (SCT) to model fast-food intake, fruit/vegetable consumption, and regular physical activity among a group of Chinese-American children in a Southeastern Virginia urban area.

An observational cross-sectional survey research design and snowball sampling were used. The survey employed items from the Health Behavior Questionnaire, the Youth Risk Behavior Survey, and a 24-hour Diet Recall Form. Eighty-four children completed the self-administered survey; 54 of these were enrolled in a Chinese Weekend School. The mean age of the children was 10.5 years (range 6-18) and 43% were girls. Logistic regression models were used to examine the predictors of eating and exercise behaviors; findings at $p<=.10$ were considered statistically significant.

Sufficient vegetable/fruit intake was more likely in children who were cared for by family members after school (OR=3.6, 90% CI=1.26-10.03). Increased fast-food intake was more likely in children who had stayed in the USA for a shorter time (OR =3.4, 90% CI=1.33-8.77). Sufficient vigorous activity was more likely in children with positive physical activity self-efficacy (OR=3.29, 90% CI=1.16-9.31). Sufficient overall activity was also more likely in children with positive self-efficacy for physical activity

(OR=3.00, 90% CI=1.03-8.77) and positive social support for exercise (OR=4.58, 90% CI=1.22-17.15). Models are also controlled for age and gender.

Findings from this study provide limited to moderate support for the use of SCT in explaining health behaviors. The findings support the use of SCT because variables from the personal construct (self-efficacy) and the environmental construct (social support) were found associated with health behaviors. The findings also support the association between the personal construct (knowledge) and the enviromental construct (parents' education). It suggests that family members play a very important role in children's health behaviors and that new immigrant children are at risk of higher fast food consumption. Further research is needed to explore the significant relationships in a larger sample.

This dissertation is dedicated to

my father, my mother and my sister.

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INTRODUCTION

圣人不治已病治未病...夫病已成而后药之...譬犹渴而穿井，斗而铸锥，不亦晚乎？

---《黄帝内经》公元前200年

A first class physician is one who could not only cure disease but also prevent disease...To administer medicine to diseases which have already developed...is comparable to the behavior of those persons who begin to dig a well after they have become thirsty, and of those who begin to make their weapons after they have already engaged in the battle. Would these actions not be too late?

---Yellow Emperor's Internal Classics, 200 B.C.

Two thousand years ago in ancient China, it was well known that disease prevention was very important to a human being's health. Today, health promotion and disease prevention still need attention because people want to have a higher quality of life than ever. Health behavior is a major link in the chain of health prevention and disease prevention, and usually has a direct influence on the quality of people's life. Unhealthy habits that are developed during childhood or adolescence are often risky and are resistant to change during the adult years. Those habits, including unhealthy dietary habits and inadequate physical activity, contribute substantially to the leading causes of death, such as heart disease and cancer, in the United States. Therefore, it is important to learn how to help children and adolescents develop healthy behaviors and avoid unhealthy behaviors that place them at increased risk for serious health problems.

The purpose of this study is to test the ability of Social Cognitive Theory (SCT) to model how well personal and environmental factors relate to the dietary behaviors and physical activity of Chinese children from three cities in the Hampton Roads area. SCT defines human behavior as a triadic, dynamic, and reciprocal interaction of personal

factors, behavior, and the environment (Bandura, 1977, 1986, 1997). The systematic expected predictors of exercises and dietary behaviors include personal factors such as demographics, acculturation, knowledge and self-efficacy, and environmental factors such as physical environment, reinforcement and social support.

Research Problems

Health behaviors, particularly patterns of dietary intake and physical activity, are generally considered as important non-genetic modifiable impacts on childhood obesity. Substantial research has examined influences of these health behaviors on the development of obesity in the general population. However, the literature examining the dietary behavior and physical activity of Chinese-American children is sparse and the following research problems need to be explored.

First, the Chinese group, the largest subgroup of Asian immigrants, has lower rates of childhood obesity, but the dietary behavior and physical activity patterns among Chinese children living in the U.S. are unknown. According to Popkin and Udry's (1998) study, among a nationally representative sample of 13,783 adolescents, the Chinese group has the lowest rate (15.3%) of obesity (using 85% BMI as the cutoff) as compared to the Anglo, African-American, Hispanic and other Asian-American groups. However, there have been few studies to account for this low rate. Therefore, this study attempts to determine if the SCT model can explain the differences in dietary behavior and physical activity patterns among Chinese children living in the US.

Second, research on health behaviors and relevant socio-cultural-environmental factors among immigrant groups like the Chinese is needed. Studies show that dietary habits and physical activity develop within the context of the family environment and are

influenced by many other environmental factors (Hayman, 2002). Although many questions regarding the influences of socio-cultural-environmental factors on health behaviors remain unanswered, few studies have addressed the potential role of the family and neighborhood environments in the development and maintenance of health behaviors including patterns of dietary intake and physical activity (French, Story, & Jeffery, 2001).

Third, research that examines on both energy intake and energy expenditure in the same study is needed. Most of the studies have focused on either energy intake, i.e., eating patterns, or energy expenditure, i.e., physical activity. Personal choices concerning calorie consumption and physical activity can lead to energy imbalance. Obesity results when intake exceeds expenditure; thus, both sides of the energy-balance equation must be considered in concert during research on the etiology of childhood obesity. Therefore, studies that adopt a combined focus on how the interaction of children's food intake and physical activity influence the energy-balance are needed.

Background

Health of Ethnic Chinese

Improving the health status of ethnic minority populations is one of the major public health challenges in the United States of America (U.S.). Asian-Americans are one of the fastest growing and most diverse minority groups in the United States and Canada (U.S. Census Bureau, 1996; Yoon & Chien, 1996). On average, Asians and Pacific Islanders have indicators of being one of the healthiest population groups in the U.S. (U.S. Department of Health and Human Services, 2000a). However, there is great diversity within this population group, and health disparities for some specific subgroups are distinct (U.S. Department of Health and Human Services, 2000a). Although

differences in gene-nutrient interactions may contribute, the role of varying cultural and socioeconomic variables still needs to be determined to understand these disparities (Deckelbaum & Williams, 2001).

According to the 2000 census, ethnic Chinese are the largest Asian subgroup in the United States (U.S. Census Bureau, 2002a). There were 2.3 million people who identified themselves as only Chinese, and an additional 0.4 million people who identified themselves as Chinese combined with at least one other race or Asian group (U.S. Census Bureau, 2002a). Recent immigrants and those living in urban areas are particularly in need of targeted health initiatives because they are often linguistically isolated and of low socioeconomic status (CDC, Truman, Wing, & Keenan, 1994; Yoon & Chien, 1996). Immigration to a new country can create a substantial shift in lifestyle and environment, including limited access to health care, decreased physical activity, and new diet, all changes that can result in rapid modifications in chronic disease risk (Satia, Patterson, Neuhouser, & Elder, 2002).

Studies strongly indicate that exposure to Western lifestyles increases the risk of developing several major chronic diseases in migrants to the United States (Fujimoto, 1996; Kin et al., 1993; Sundquist & Winkleby, 2000; Ziegler et al., 1993). Chinese living in North America have higher rates of chronic diseases such as diabetes, heart disease, and some cancers than those living in Asia (Campbell, Parpia, & Chen, 1998; LaMarchand, Wilkens, Kolonel, Hankin, & Lyu, 1997). The higher rates of some chronic diseases seen in Chinese-Americans and Chinese-Canadians have been largely attributed to environmental factors, especially changes in dietary intake and physical activity (Lee et al., 1994; Schultz, Spindler, & Josephson, 1994; Sun & Chen, 1994;

Whittemore et al., 1995). In one study of 2,488 ethnic Chinese men and women in the United States, Canada, and China, the reported median percent energy from fat is 35% in North-American Chinese and 20% in native Chinese. Further, Chinese in China reported spending more time in vigorous activity, sleeping, and walking but fewer hours in sitting than do Chinese in North America. Chinese in China weigh less and are leaner than North American Chinese (Lee et al., 1994). In particular, the adoption of diets high in fat and low in fruits and vegetables is of concern because this dietary pattern is a risk factor for several major chronic diseases (American Institute for Cancer Research & World Cancer Research Fund, 1997; US Dept of Health and Human Services, 1988). In light of these factors, an understanding of acculturation's influences on the lifestyles of ethnic Chinese and potential protective factors will help encourage this minority group to maintain traditional healthful life patterns while adopting behaviors of the host country that contribute to health.

Obesity and Healthy People 2010

Obesity is becoming a significant public health problem in the U.S. with severe health and psychosocial consequences. The "Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity" report estimates that obesity and its complications are already costing the nation $117 billion annually (U.S. Department of Health and Human Services, 2000b). The threat of obesity is greater than ever for U.S. children and adolescents (Deckelbaum & Williams, 2001). Studies indicate that the current generation of children will grow into the most obese generation of adults in U.S. history (Hill & Trowbridge, 1998a). However, the most serious health effects of childhood obesity may not be seen until several decades later (Hill & Trowbridge,

1998a). Overweight children are much more likely to end up obese as adults (Dietz, 1998). Obesity in adulthood is a known risk factor for chronic diseases including heart disease, diabetes, high blood pressure, stroke, and some forms of cancer (Dietz, 1998). It is obvious that obesity has significant negative consequences on the quality and years of healthy life (Dietz, 1998; Fagot-Campagna et al., 2000; Freedman, Dietz, Srinivasan, & Berenson, 1999; Gortmaker, Must, Perrien, Sobol, & Dietz, 1993; Richardson, Goodman, Hastorf, & Dombusch, 1961; Sargent & Blanchflower, 1994; Staffieri, 1967; U.S. Department of Health and Human Services, 2000b).

Healthy People 2010 is the blueprint that reflects the major public health concerns in the United States which affect the quality and years of healthy life (U.S. Department of Health and Human Services, 2000a). Increasing both the quality and the years of healthy life is one of two overarching goals of Healthy People 2010 (U.S. Department of Health and Human Services, 2000a). The top two leading health indicators of Healthy People 2010 are "physical activity" and "overweight and obesity" (U.S. Department of Health and Human Services, 2000a). Thus, "nutrition and overweight" along with "physical activity and fitness" are listed as two of the 26 Healthy People 2010 objectives to address the current epidemic of overweight and obesity (U.S. Department of Health and Human Services, 2000a). It is becoming more important than ever to understand how nutrition and physical activity relate to weight status, and the factors that may influence dietary behavior and physical activity (Kelner & Helmuth, 2003). One productive research approach is to proceed from examining factors that affect energy balance to identifying more proximal influences on those factors (Dietz & Gortmaker, 2001).

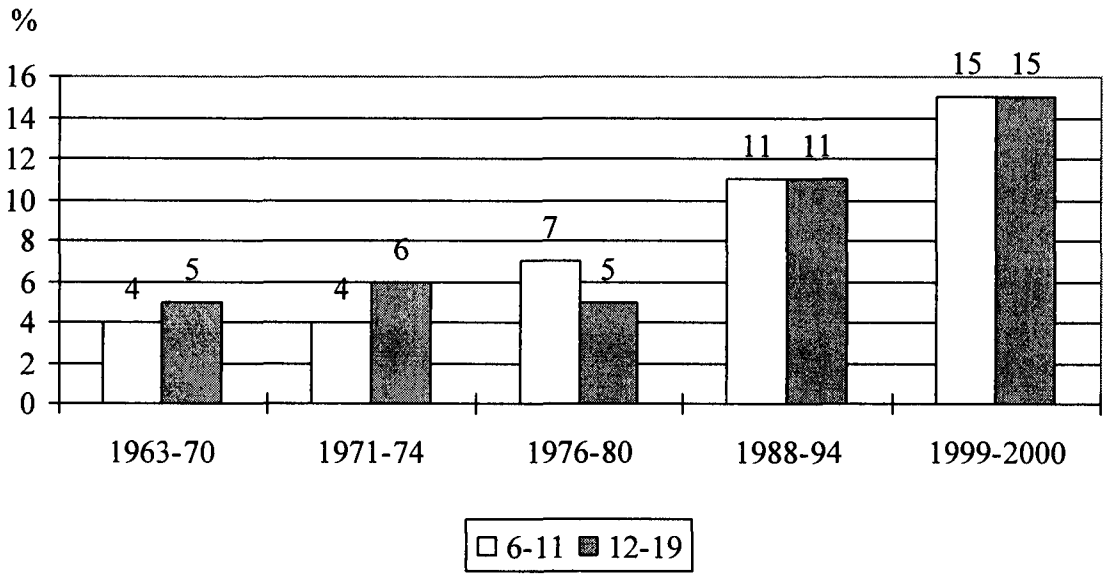
Prevalence of Childhood Obesity

The number of overweight children, adolescents, and adults has risen over the past four decades. Using the Body Mass Index (BMI) as the standard, data compiled from the National Health and Nutrition Examination Surveys (NHANES) and other sources show that 11% of young people 6-17 years old were overweight in 1988-1994, while an additional 14% of young people were close to overweight, compared to about only 4% in 1963-1965 (Ogden, Flegal, Carroll, & Johnson, 2002; Troiano & Flegal, 1998). Results from the 1999-2000 National Health and Nutrition Examination Survey (NHANES) indicate that an estimated 15% of children and adolescents ages 6-19 years old are overweight, which represents a 4% increase from the overweight estimates of 11% obtained from the 1988-94 NHANES III (Ogden et al., 2002). Figure 1 shows the increasing trend of obesity and overweight. Overweight* is defined by the age- and sex-specific 95th percentile of BMI from NHANES III (Troiano & Flegal, 1998). The prevalence of overweight does not vary systematically with race-ethnicity and social-economic status. Data collected from 1988 to 1994 for NHANES III indicate that the prevalence of overweight among children and adolescents is substantially higher than in the reference population across virtually all racial-ethnic, age, and sex groups (Troiano & Flegal, 1998). In adults, an inverse relationship between socioeconomic status and overweight or obesity frequently is found among women and only sometimes among men (Sobal & Stunkard, 1989). Studies of children find a weaker and less consistent relationship between socioeconomic status and overweight in girls than in women, and

* In the data referred, BMI is used as the measure of weight status, and children are described with respect to overweight, not obesity according to CDC recommendation (Centers for Disease Control and Prevention).

often find the same relationship in boys as in girls (Sobal & Stunkard, 1989). In the NHANES III data, overweight prevalence among Mexican-American and non-Hispanic black children and adolescents is not related to family income (Troiano & Flegal, 1998).

Figure 1: Prevalence of Overweight Among Children and Adolescents 6-19 Years Old*



*Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Examination Survey, and National Health and Nutrition Examination Survey (NHANES III).

Though no systematic variety is found across racial-ethnic groups, changes are noticed among minority groups. The prevalence of overweight among children in the United States is continuing to increase, especially among Mexican-American and non-Hispanic black adolescents. The prevalence of overweight among non-Hispanic black and Mexican-American adolescents increased more than 10 % between 1988-1994 and 1999-2000 (Ogden et al., 2002). An earlier study shows that Asian-American adolescents born in the U.S. are more than twice as likely to be obese as are first-generation residents of the U.S. (Popkin & Udry, 1998).

Factors Related to Childhood Obesity

Genetic Factors

Body weight results from the interaction of genes, metabolism, behavior, environment, culture, and socioeconomic status (Hill & Melanson, 1999). While between 30% and 50% of the variance in adiposity within a population is attributable to genetic differences (Bouchard, 1996), the genetic composition of the population does not change rapidly; therefore, the large increase in obesity is likely due to the changes in non-genetic factors (Hill & Trowbridge, 1998b). Specifically, because the gene pool within the US population did not change materially over the 15 years encompassed by the two NHANES surveys, the changes in the prevalence of overweight can be accounted for only by environmental effects on energy balance (Troiano, Flegal, Kuczmarski, Campbell, & Johnson, 1995). Key mechanisms include alterations in the balance of dietary intake and physical activity levels of children and youth (Dietz & Gortmaker, 2001). Non-genetic factors, such as behavior and environment, play a large role in causing people to be overweight and obese (Hill & Peters, 1998).

Environmental Factors

Childhood obesity is a significant public health problem with the severe health and psychosocial consequences, which may be, in part, driven by the urban environment. In American urban areas there are inadequate numbers of outdoor playgrounds (French et al., 2001). This lack, combined with a high access to places that promote high-fat, high sodium, and oversized portions of food such as fast food restaurants, may promote obesity.

Our current environment is characterized by an abundant supply of convenient, relatively low-priced, highly tasty, energy-dense foods, joined with a lifestyle requiring less physical activity. Such an environment promotes high energy intake and low energy expenditure and appears to make obesity occur more frequently (Hill & Peters, 1998). A previous study indicates that the problem of being overweight in children and adolescents is generally caused by lack of physical activity, unhealthy eating patterns, or a combination of the two (Hill & Melanson, 1999). These are primary areas that need to be targeted for prevention and treatment actions (U.S. Department of Health and Human Services, 2000b).

Physical environment factors are consistently related to physical activity behavior (Humpel, Owen, & Leslie, 2002). The availability and accessibility to exercise places such as footpaths, health clubs, and swimming pools are found to be associated with physical activity (Booth, Owen, Bauman, Clavisi, & Leslie, 2000; J. F. Sallis, Johnson, Calfas, Caparosa, & Nichols, 1997; Stahl et al., 2001; Troped et al., 2001), but the current physical environment in the U.S. does not to encourage physical activity. Only 46% of municipal and county park and recreation departments provide fitness trails, 29% provide

hiking trails, and 21% provide bicycle trails (French et al., 2001). National Recreation and Park Association guidelines recommend at least one community swimming pool per 20,000 people within a travel-time radius of 15-30 minutes (National Recreation and Park Association, 1983). Only 56% of municipal and county park and recreation departments provide a community swimming pool and national estimates indicate that there is only one pool per 53,000 people (French et al., 2001). Basketball and tennis court availability is also much lower than recommended (French et al., 2001).

In addition, working parents, especially working mothers, might not have time to take the children to play outside or to cook healthy meals for the children. In 1900, 21% of women were in the workforce and typically women devoted 44 hours per week to meal preparation and cleanup (Bowers, 2000). By 1950, 29% of women were in the workforce and on average women spent fewer than 20 hours per week on meal preparation and cleanup. By 1998–1999, 60% of women were in the workforce; 71% of married women with husbands and children under the age of 18 years were working (versus 45% in 1975) and 27% of households with children were headed by single parents (Bowers, 2000; U.S. Census Bureau, 1998). This trend may lead to the lack of physical activity and unhealthy diet that is related to overweight in children.

Dietary Behaviors

In the U.S., poor diets that are too high in calories and fats and too low in fruits and vegetables are problems commonly considered to be associated with certain preventable illnesses, premature deaths, and obesity (Frazao, 1999). Statistics show that dietary factors are associated with four of the 10 leading causes of death: coronary heart disease (CHD), some types of cancer, stroke, and type 2 diabetes (National Center for

Health Statistics, 1997). These diet-related health conditions are estimated to cost society over $200 billion each year in medical expenses and lost productivity (Frazao, 1996).

Interestingly, Americans are slowly adopting more healthful diets even while more Americans than ever are overweight. The data show that the individual intake of fat as a percentage of the total calorie intake has decreased, from 42% in 1970 to 38% in 1994 (Harnack, Jeffery, & Boutelle, 2000), while the absolute grams of fat available per capita have increased from 154g/day in 1970 to 159g/day in 1994 (Putnam & Gerrior, 1999). Americans (per capita) consumed 24% more fruits and vegetables in 1997 than they did in 1970 (Putnam & Gerrior, 1999). Countering these positive signs is evidence that fiber consumption is low, and snack foods are as popular as ever (Kennedy, Blaylock, & Kuhn, 1999).

Key dietary behavior shifts include more out-of-home food consumption. The mean reported number of out-of-home meals per week was 2.5 in 1987 and 1992, and 2.8 in 1999-2000 (Kant & Graubard, 2003). In 1987, approximately 72% of the population reported eating out at least one time per week, and that proportion increased from 72% in 1987 to 76% in 1999-2000 (Kant & Graubard, 2003). Those reporting three or more weekly eating-out meals increased from 36% in 1987 to 41% in 1999-2000 (Kant & Graubard, 2003). Major shifts related to diet also involve large increases in total energy from salty snacks, soft drinks, and pizza, and large decreases in energy from low- and medium-fat milk and medium- and high-fat beef and pork (Nielsen, Siega-Riz, & Popkin, 2002).

Children are consuming diets considered to promote obesity, i.e., diets high in fat and low in fruits and vegetables (U.S. Department of Health and Human Services,

2000a). In 2001, 78.6% of children had not eaten more than five servings per day of fruits and vegetables during the seven days preceding the Youth Risk Surveillance Survey nationwide (Centers for Disease Control and Prevention, 2002). Children are inclined to choose energy-dense (high calorie) foods over energy-dilute (low calorie) foods because of the flavors in these foods and the positive physiologic consequences from eating energy-dense foods, especially when they are hungry (Birch & Fisher, 1998). In an extensive literature review, Birch and Fisher (1998) suggest that children's food preferences are shaped by early experiences with food, family eating habits, and social contexts of eating. Health researchers must learn how patterns of high-fat, energy-dense diets develop and how the diets may be modified at different stages of children's development. Therefore, insights gained from research into family environments and parenting practices may assist in developing interventions to improve childhood dietary practices, which may lead to development of healthier eating patterns.

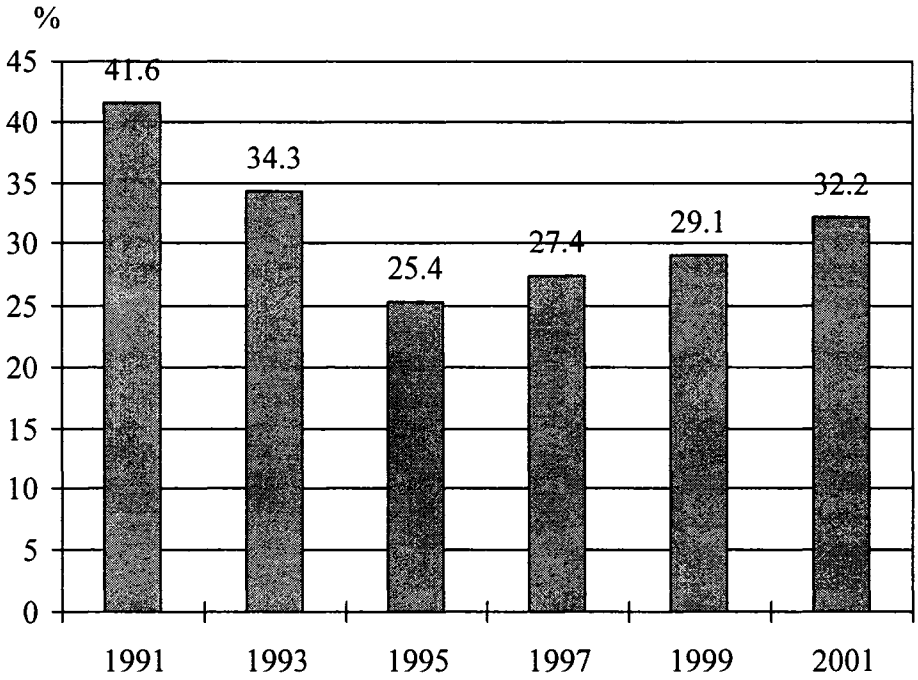
Physical activity

Regular physical activity helps to enhance the quality of life for people of all ages (U.S. Department of Health and Human Services, 2000a). The risk that physical inactivity to the development of Chronic Heart Disease (CHD) is considered as high as other risk factors, such as cigarette smoking, high blood pressure, and high blood cholesterol (U.S. Department of Health and Human Services, 2000a). However, physical inactivity is more universal than any one of these other risk factors (U.S. Department of Health and Human Services, 2000a).

The current generation of children may be the most sedentary in human history. Using data from the Muscatine Study, Janz and his colleagues (1992) reveal that pubertal

and post-pubertal children spend only 8-10 minutes per day in aerobic activity. Another study also shows that girls aged 7-15 years old spend, on average, 8-10 minutes per day in vigorous physical activity, while boys of the same age spend approximately 30 minutes per day in vigorous activity (Livingstone et al., 1992). Kohl and Hobbs (1998) reviewed the development of physical activity patterns, and suggest that modern lifestyles are contributing to a decline in physical activity by providing more and more opportunities to be sedentary and fewer demands to be even moderately active. The recent data from national surveys in the United States and Canada suggest a descending trend in childhood physical activity (Dietz, 1998). As shown in Figure 2, more than a third of young people in grades 9-12 do not regularly engage in vigorous-intensity physical activity (U.S. Department of Health and Human Services, 2000a). Daily participation in high school physical education classes dropped from 42% in 1991 to 32% in 2001 (Centers for Disease Control and Prevention, 2002). It is important to prevent the trend; therefore, insights gained from research into factors related to physical activity/inactivity may assist in developing interventions to improve childhood exercise habits, which may lead to the development of a healthier lifestyle.

Figure 2: Students Attending A Physical Education (PE) Class Daily*



*Source: Youth Risk Behavior Surveillance--United States, 2001

Maintenance of Ethnic Chinese Heritage

Acculturation is commonly used to describe the process by which a racial/ethnic minority adopts the cultural patterns (e.g., beliefs, religion, language) of a dominant/host group (Satia, Patterson, Neuhouser et al., 2002). To study an ethnic minority group such as the Chinese, one cannot ignore the cultural background. It is suggested that acculturation can result in changes in attitudes, beliefs, behaviors (e.g., diet), and values of individuals (Satia, Patterson, Neuhouser et al., 2002). High levels of acculturation toward the U.S.-majority culture generally correspond to more unhealthy eating behaviors, such as increased consumption of fat (Winkleby, Albright, Howardpitney, Lin, & Fortmann, 1994). Therefore, maintenance of ethnic Chinese heritage could be valued as a way of fighting the negative influences of acculturation on their health behaviors.

In order to maintain the ethnic culture and cohesiveness in the family, Chinese parents expect their children to learn the Chinese language (Luo & Wiseman, 2000). Chinese language schools have been initiated in light of these expectations. More than 83,000 students are taking Chinese language instruction in 634 Chinese heritage community language schools in the United States (Chao, 1997). These schools generally are operated by parent volunteers and affiliated with ethnic or religious organizations (Chao, 1997). Chinese schools offer language and socio-cultural continuity for parents as well as for students by functioning as an extended cultural family home (Wang, 1995).

Significance of the Study

The Surgeon General acknowledges the obesity issue in the "*Surgeon General's Call To Action To Prevent and Decrease Overweight and Obesity*" report by stating that, "The Nation must invest in research that improves our understanding of the causes,

prevention, and treatment of overweight and obesity. A concerted effort should be made to: increase research on behavioral and environmental causes of overweight and obesity...." The results of this study may be used as baseline information to assess the relevant factors of dietary behaviors and physical activity hence address obesity prevention and to develop health behavior education programs.

This study also provides information concerning the effect of acculturation on the health of Chinese-Americans. Health care and health education professionals need to understand that there is a strong relationship between acculturation and the health status of Asians in the United States (Luquis, 1995). Acculturation might be associated with an increase in health risks and poor health behaviors (Luquis, 1995). A previous study showed that generally the second and third generation of Asian-American and Hispanic adolescents born in the U.S. are more than twice as likely to be obese as are first generation residents (Popkin & Udry, 1998). This study is expected to provide information on the relationship between health behaviors and cultural background among second or third generations of Chinese immigrants.

Overview of the Theoretical Framework

The Social Cognitive Theory (SCT) defines human behavior as a triadic, dynamic, and reciprocal interaction of personal factors, behavior, and the environment (Bandura, 1977, 1986, 1997). According to this theory, an individual's behavior is uniquely determined by each of these three factors. This theory is used as the framework to examine the relationships between behaviors (exercise and dietary behaviors), personal factors (demographics, acculturation, knowledge and self-efficacy), and environmental

factors (physical environment, reinforcement and social support) among Chinese-American children.

While the SCT purports that response consequences mediate behavior, it maintains that behavior is largely regulated antecedently through cognitive processes. Therefore, response consequences of a behavior are used to form expectations of behavioral outcomes. It is the ability to form these expectations that gives humans the capability to predict the outcomes of their behavior, before the behavior is performed. A limitation of the SCT theory is that its comprehensiveness and complexity make it difficult to operationalize. Therefore, many applications of the SCT focus on a few constructs of a problem instead of on all of them. The constructs used in the current study are knowledge, self-efficacy, environment, and reinforcement.

Research Questions

Based on SCT, the research questions to be addressed by this study are:

1. Does SCT provide a good model for dietary behavior and physical activity in Chinese-American children?
2. How are demographic characteristics associated with children's dietary behavior and physical activity?
3. How is acculturation associated with children's dietary behavior and physical activity?
4. How are knowledge and self-efficacy associated with children's dietary behavior?
5. How are physical environmental factors associated with children's dietary behavior and physical activity?
6. How are social environmental factors associated with children's dietary behavior and physical activity?

7. How are personal factors related to environmental factors?

Overview of the Methodology

An observational cross-sectional survey research design was employed. A cross-sectional study can establish associations between many variables while using statistical controls. However, no causal relationship can be derived because the data are collected at one point in time. The major threat to internal validity of this design is social desirability bias, i.e., participants in the study may want to present themselves to evaluators in the best possible light. Snowball sampling was utilized in this study. Participants were initially recruited through the Tidewater Chinese Weekend School and American-Chinese Association. Data were collected via self-administrated questionnaires from Chinese children in Norfolk, Chesapeake and Virginia Beach, Virginia. The questionnaire is based on the Health Behavior Questionnaire, Youth Risk Behavior Survey, and 24-hour diet recall form. Collected data were entered by the researcher and analyzed using Statistical Package for Social Science. A .10 significance level was selected because of the small sample size in the current study.

CHAPTER II

LITERATURE REVIEW

This chapter lays the foundation for this study through a review of the theoretical framework and relevant research findings. The following four categories are included in the literature review: (1) Theoretical framework, Social Cognitive Theory, (2) Personal Factors and Health Behaviors, (3) Environmental Factors and Health Behaviors, and (4) Issues of Measurement.

Theoretical Framework-Social Cognitive Theory (SCT)

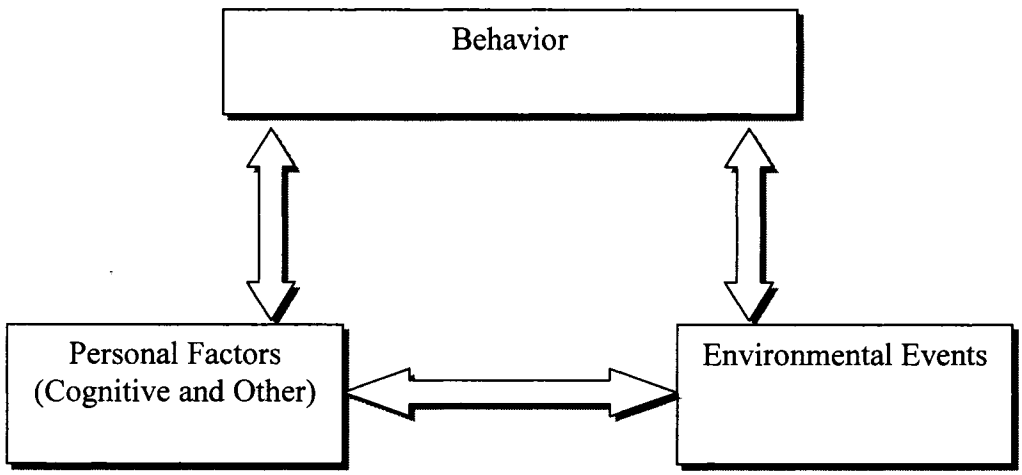
Overview

The Social Cognitive Theory (SCT), formally described in Albert Bandura's book *Social Foundations of Thought and Action: A Social Cognitive Theory*, stemmed from Social Learning Theory (SLT) (Bandura, 1986). SCT defines human behavior as a triadic, dynamic, and reciprocal interaction of personal factors (including cognition), behavior, and the environment (Bandura, 1977a; 1986; 1989). The theory emphasizes reciprocal relationships between personal factors (e.g., self-efficacy), environmental factors (e.g., social reinforcement), and behavior (e.g., vigorous physical activity). The relationship is shown in Figure 3. The purpose of this theory is to understand and predict individual and group behavior. It is used to identify methods in which behavior can be modified or changed. It also is used in interventions aimed at personality development, behavior pathology, and health promotion (Bandura, 1986).

The reasons that SCT is particularly relevant to health education and health behavior programs are threefold. First, SCT combines previously disparate cognitive, emotional, and behavioristic understandings of behavioral change. Second, SCT

identifies several important constructs and processes related to paths for new behavioral research and practice in health education. Third, SCT allows the application of theoretical ideas developed in other disciplines, such as psychology, to health behaviors and behavioral change, allowing the researcher to benefit from the insights and understanding (Baranowski, Perry, & Parcel, 2002).

Figure 3: Model of the SCT (Bandura, 1986): The Relationship Among The Three Classes of Determinants In Triadic Reciprocal Model



Constructs of SCT

Bandura (1977; 1986) formulated a number of SCT constructs, such as Symbolizing Capability, Vicarious Capability, Forethought Capability, Self-Regulatory Capability, and Self-Reflective Capability, which are important to understanding health behavior. However, the comprehensiveness and complexity of SCT make it difficult to operationalize. Consequently, many applications of SCT focus on a few of the particular constructs rather than all of them. Bandura's constructs as summarized by Baranowski, Perry and Parcel (2002) are more suitable for health promotion and health education programs. The constructs used in the current study are based on Baranowski et al.'s (2002) work and, as such, are presented in Table 1 and discussed below.

Personal Factors

Among the fundamental personal factors are the individual's abilities to learn by observing others, to symbolize behavior, to predict the outcomes of behavior, to be confident in performing a behavior (including overcoming the barriers of performing the behavior), to self-determine or self-regulate behavior, and to contemplate and analyze experience (Bandura, 1997). The concepts, as employed in the current study, are discussed below.

Behavior Capability. Behavior Capability maintains that if a person is to perform a particular behavior, he or she must know what the behavior is (knowledge of the behavior) and how to perform it (skill) (Baranowski et al., 2002). For example, to promote consumption of healthy food, children must know which foods are healthy for them and how to use the information to make choices about foods.

Table 1: Major concepts in Social Cognitive Theory and implication for intervention

Concept	Definition	Implication
Behavioral Capability	Knowledge and skill to perform a given behavior	Promote mastery learning through skill behavior
Self-efficacy	Confidence in performing a particular behavior and in overcoming barriers to that behavior	Approach behavior change in small steps to ensure success; seek specificity about the change sought
Environment	Factors physically external to the person	Provide opportunities and social support
Reinforcements	Responses to a person's behavior that increase or decrease the likelihood of reoccurrence	Promote self-initiated rewards and incentives

(Source: Health behavior and Health education: Theory, Research, Third Edition, Karen Glanz (Editor), Barbara K. Rimer (Editor), Frances Marcus Lewis (Editor) 2002).

Self-efficacy. Self-efficacy is defined as the confidence a person feels in his or her ability to perform a particular activity, including the confidence to overcome barriers to performing that behavior (Baranowski et al., 2002). Bandura (1986) proposed that, "Efficacy involves a generative capability in which cognitive, social, and behavioral sub-skills must be organized into integrated courses of action to serve innumerable purposes...it is concerned not with the skills one has, but with the judgments of what one can do with whatever skills one possesses," (p. 391). Bandura (1986; 1997) suggests that self-efficacy reflects a person's belief in his or her ability to overcome the difficulties inherent in performing a specific task in a particular situation, and that self-efficacy is the most important prerequisite for behavior change because it impacts how much effort is devoted to a given behavior and what level of performance is accomplished. In other words, self-efficacy determines what behaviors a person will attempt, the effort they will expend, and how persistent they will be when confronted with barriers. Bandura (1986) argues that self-efficacy influences choices of behavior a person undertakes, such as starting new behaviors and changing existing behaviors. A person will pursue tasks that he or she believes they can accomplish and avoid those that exceed their perceived capabilities. For example, if a person has high confidence in his or her ability to exercise three times a week, then the likelihood of that person going to the gym regularly is increased. Self-efficacy is context specific, which distinguishes it from more global personality attributes such as self-esteem and self-concept (Resnicow et al., 1997). Measurement of self-efficacy must be specific to the target behavior and to the barriers faced by the target audience (Mainbach & Murphy, 1995).

Environmental Factors

Environment. The term environment refers to the physically external objective factors that can influence a person's behavior (Baranowski et al., 2002). The environment has been increasingly recognized as important in health behavior change. The environment component of SCT is important partly because it provides models for behavior; a person can learn from others not only by receiving reinforcements from them, but also by observing them (Baranowski et al., 2002). For instance, a model of family reciprocal determinism indicates that behavior is a function of a shared environment with other family members, their behavior, and their personal characteristics, all of which function within a larger environment (Baranowski, 1990; Taylor, Baranowski, & Sallis, 1994).

Environment can be divided into the physical environment and the social environment (Baranowski et al., 2002). The physical environment might include the distance to a recreation center, the availability of a playground, or the availability of certain food. Examples of social environment include the involvement of family members, friends, and peers at school or in the classroom. To illustrate, certain foods a child eats are, in part, a result of the availability of certain foods in the home, certain types of foods that the parents encourage the child to eat (Iannotti, O'Brien, & Spillman, 1994), and seasonal and regional availability of particular foods (J. Sallis, Nader, Rupp, Atkins, & Wilson, 1986).

Reinforcement. Reinforcement, considered as a part of social environment including positive and negative aspects, is the primary construct in the Social Learning Theory and adapted by SCT (Baranowski et al., 2002). Positive reinforcement,

sometimes referred to as reward or social support, is a response to a person's behavior that increases the likelihood that the behavior will be repeated (Baranowski et al., 2002). Complimenting someone will increase the likelihood that the person repeats the behavior for which the compliment was provided, especially if the person performing the behavior values the opinion of the person making the compliment. Negative reinforcement is a withdrawal of a negative stimulus when a behavior is performed, which increases the likelihood that the desired behavior will be repeated (Baranowski et al., 2002). For example, smoking is negatively reinforcing because the inhaled nicotine removes negative effects such as depression, anger, and anxiety (Baranowski et al., 2002). Another example is eating when depressed. Eating certain foods, such as chocolate, helps the withdrawal from depression; hence, when the person feels depressed again, he or she will repeat eating the certain food (Baranowski et al., 2002).

Examples of Studies Employing SCT

Health educators and health behaviorists have employed SCT to develop interventions, procedures or techniques that affect underlying cognitive variables, thereby increasing the likelihood of behavior change. Three studies applying SCT as the theoretical framework are selected and discussed in the following section. The three studies are selected because they use various constructs of SCT to explore how the constructs predict dietary behaviors (Study 1), exercise (Study 2) or both (Study 3) among children. The findings support the use of SCT to predict health behaviors.

Study 1: *A Social Cognitive Theory Study Approach to Examine Dietary Behaviors among Fourth Graders* (Corwin, Sargent, Rheaume, & Saunders, 1999). In this research, an SCT framework was used to design a study of the impact of factors on

children's dietary practices. A stratified random sample of 717 fourth grade children was surveyed. Survey results supported the use of SCT in modeling the dietary behaviors. Model-building procedures revealed that self-efficacy, social support, meal preparation involvement, and fruit/vegetable availability were associated with dietary behaviors. The study concluded that components of SCT may prove useful in developing nutrition education for children. Also, compared to white children, black children were more likely to consume fewer dairy foods, more fat, and more sugary foods; girls were more likely than boys to consume more fruits and vegetables and less protein.

Study 2: *Using Social Cognitive Theory to Explain Discretionary, "Leisure-Time" Physical Exercise among High School Students* (Winters, Petosa, & Charlton, 2003). This study examined whether knowledge of high school students' actions of self-regulation, perceptions of self-efficacy, social situation, and outcome expectation will predict leisure time moderate and vigorous physical exercise. A total of 248 high school students who enrolled in introductory physical education courses completed questionnaires that targeted selected SCT variables. Students also reported their typical "leisure-time" exercise participation using a standardized questionnaire. Results showed that each of the four predictors was significantly associated with measures of moderate and vigorous exercise frequency. All predictor variables were significant in the final regression model used to explain vigorous exercise. The study concluded that components of SCT may prove useful in understanding and predicting physical activity.

Study 3: *The Child and Adolescent Trial for Cardiovascular Health* (Edmundson, Parcel, Feldman et al., 1996). The Child and Adolescent Trial for Cardiovascular Health (CATCH) is a multi-site study of a school-based intervention to

reduce or prevent the development of risk factors for cardiovascular disease. This research was designed to evaluate the results of a three-year intervention, focusing on the psychosocial variables conceptualized from SCT as determinants of dietary and physical activity behaviors. Pre- and post-measurements on the health behavior questionnaire were collected from over 6,000 students from a total of 96 schools across four study sites: California, Louisiana, Minnesota, and Texas. The schools were randomized to two treatment conditions: intervention and control. The results showed significant effects in improved knowledge, intentions, self-efficacy, usual behavior, and perceived social reinforcement for healthy food choices ($P< 0.0001$ for these five variables) after three years, but showed irregular effects for perceived support and self-efficacy for physical activity. The CATCH program demonstrates that changing certain psychosocial variables, such as self-efficacy, is likely to influence a reduction in behavior for development of risk factors for cardiovascular disease as SCT predicts. The Health Behavior Questionnaire in the CATCH program used SCT as the theoretical foundation and is used in this dissertation research.

The reviewed research studies share the following characteristics that are relevant to this study. First, the most commonly used construct of SCT is the personal factor, which includes knowledge and self-efficacy. Second, though the construct of environmental factors has been explored in the research, most studies focus on social rather than physical environments, thus leaving a gap in information available about how physical environmental factors relate to behavior. This study seeks to address this gap. Third, even though SCT addresses reciprocal relationships among three classes of determinants, most studies examine the relationship in only one direction, i.e., from

personal and environmental factors to behaviors. Similar to the three studies presented above, this study also focuses on a single direction of the SCT factors, i.e., how personal and environmental factors affect behaviors.

The comprehensiveness and complexity of SCT make it difficult to operationalize. Consequently, many applications of SCT focus on a few of the particular constructs rather than all of them. This study looks at some of the SCT components rather than all due to a similar reason. A discussion of personal factors affecting behaviors and environmental factors affecting behaviors follows.

Personal Factors and Health Behaviors

Personal factors reviewed in this section are demographic characteristics, acculturation, knowledge, and self-efficacy.

Demographics and Behaviors

Demographics and Dietary Behavior

Previous studies revealed that age is not a significant predictor for food intake. Nationwide Food Consumption surveys examined food intake by children age two through nine years old from 1977, 1978, 1989 to 1991, and 1994 to 1996, and 1998 (Nielsen et al., 2002). The sample consisted of 63,380 individuals, two years old and up. For each survey year, the percentage of total energy intake from meals and snacks was calculated separately for 2- to 18-year-olds, 19- to 39-year-olds, 40- to 59-year-olds, and those 60 years and older. The results showed that the trends in location (at-home consumption or preparation, vending, store, eaten out, restaurant/fast-food, and school) and food sources were almost identical for all age groups.

Unlike age, gender seems to play a role in food preference. Girls scored higher (healthier) on food preferences and diet self-efficacy than did boys, but no difference was detected in their actual diet behavior (Robinson, 1999). The gender difference of dietary behavior was also noticed by one previous study indicating girls reported more healthful eating habits than boys (Cohen, Brownell, & Felix, 1990). Girls had more weight-related concerns than boys and these concerns increase with age thus accounting for the difference (Gustafson-Larson & Terry, 1992).

Demographics and Physical Activity

Demographic characteristics play a role in physical activity. Based on the Theory of Planned Behavior and the Theory of Reasoned Action, Craig, Goldberg, and Dietz (1996) developed and administered a questionnaire to assess vigorous activity among 310 fifth and eighth graders in Cambridge, Massachusetts. The children's heights and weights were measured and questionnaires were completed during physical education classes. Results showed a gender difference in the level of vigorous activity. In each grade, girls reported being less active at vigorous activity than did boys. Eighth-grade girls reported significantly fewer hours of vigorous activity than did eighth-grade boys. The authors suggested that gender differences related to intent to participate in vigorous activity, perceived behavioral control, and sense of competency are evident in eighth grade and may begin in fifth grade.

In addition to gender, age is also associated with physical activity levels. Strauss, Rodzilsky, Burack, and Colin (2001) explored the relationship between health beliefs, self-efficacy, social support, and sedentary activities and physical activity levels in children. Ninety-two children 10-16 years old completed a study that measured physical

activity level, health beliefs, self-efficacy, social influences, and time spent in sedentary behaviors. The findings revealed that overall, children spent 75.5% of the day inactive, with a mean of 1.8 hours watching television, sitting at the computer, and doing homework. In contrast, only 1.4% of the day (about 12.6 minutes) was spent in vigorous activity. The results showed a significant decline in physical activity levels between ages 10 and 16 years, particularly in girls. Preteen girls spent approximately 35% more time in low- and high-level activity than did teenage girls. Time spent in sedentary behaviors was inversely correlated with the amount of moderate-level activity but not high-level activity. In contrast, time spent in high-level activity positively correlated with self-efficacy scores and social influence scores.

Determinants of levels of childhood physical activity and dietary behavior are complex. One study by Sallis, Prochaska, and Taylor (2000) found that, for children aged 3-13 years old, the variables consistently associated with physical activity were sex (male), parental overweight status, physical activity preferences, intention to be active, perceived barriers (inversely related), previous physical activity, healthy diet, program/facility access, and time spent outdoors. For adolescents 13-18 years old, some of the variables found consistently associated with physical activity were slightly different from those for younger children. Variables included sex (male), ethnicity (white), age (inversely related), perceived activity competence, intentions, depression (inversely related), previous physical activity, community sports, sensation seeking, sedentary behaviors after school and on weekends (inversely related), parent support, support from others, sibling physical activity, direct help from parents, and opportunities to exercise (J. Sallis et al., 2000). Demographics alone cannot explain the variety of

behaviors. Therefore most investigators have focused on other personal factors such as knowledge and self-efficacy.

Knowledge and Health Behaviors

Knowledge and Dietary Behavior

Knowledge about food is related to dietary behavior. Nowak and Büttner (2003) examined the relationships between specific food- and weight-related beliefs, knowledge and the associated behaviors. This cross-sectional study was conducted among 1933 high school students from a coastal, urban town in northern Australia. The questions for the survey were either designed specifically for the study or adapted from previously published studies. The findings showed strong relationships between concern and beliefs about food and the consumption behavior of those foods. They also revealed an association between the knowledge that high fat foods should be reduced and the actual decreased consumption of those foods. However, knowledge of desired food intake for weight loss had little effect on the behavior of those who reported trying to lose weight. Beliefs about food and weight may be more important than knowledge when altering food related health behavior.

Berg, Jonsson, Conner, and Lissner (2002) investigated the relationship between dietary knowledge and beliefs of schoolchildren and breakfast choices, with specific attention to fat and fiber content. A total of 181 children aged 11-15 years old were instructed to select food items among photographs of breakfast foods. In addition to choosing their own typical breakfasts, they were asked to exchange foods in hypothetical breakfasts to create meals with less fat and more fiber. The interview also consisted of recent changes in breakfast habits, and perceptions of healthy breakfasts, dietary fat, and

foods rich in fiber. Results showed that knowledge concerning sources and health attributes of dietary fiber was associated with usual consumption of bread and breakfast cereals rich in fiber. However, no association was observed between food choices and knowledge of a food-packaging symbol indicating low-fat and fiber-enriched foods. The authors suggested that lack of knowledge about healthy eating may be important barriers to the development of health-promoting food habits by schoolchildren.

In a study about nutritional status and health behaviors of fourth grade students in Virginia, Shufflebarger, McGarvey, and Clavet (1998) surveyed a total of 904 students to obtain a collection of anthropometric data. The surveys were conducted in a classroom setting using the Child and Adolescent Trial for Cardiovascular Health (CATCH) survey tool. Selection was based on a random sample representing the overall demographics of Virginia. The findings showed that 33.7% of the students were identified as either overweight or obese based on BMI measurements. Although the children indicated on the survey that they were knowledgeable about which foods are most nutritious, their food selections were not consistent with their knowledge.

Knowledge and Physical Activity

Knowledge is also related to physical activity. A longitudinal study revealed significant relationships when exploring the predictive value of the determinants for exercise (DiLorenzo, Stucky-Ropp, Vander Wal, & Gotham, 1998). Data were collected from 111 families (54 girls and 57 boys) who were interviewed in both Phase I (5th and 6th grades) and Phase 2 (8th and 9th grades) of the study. Results indicated that at Phase 2, "child's exercise knowledge" emerged as a predictor for both girls' and boys' degree of physical activity.

Studies among adults also showed similar findings. A study examining self-reported activity, measured fitness status, exercise knowledge, and exercise beliefs was conducted among 48 African-American and 51 white women (aged 50-77) who were in good health (Fitzgerald, Singleton, Neale, Prasad, & al., 1994). The study found that activity level was predicted by the knowledge question concerning heart rate during exercise necessary to maintain fitness, the belief concerning the difficulty "to stick to a regular schedule of physical activity," and the belief concerning the difficulty "to find the time to exercise on a regular basis."

Two longitudinal data sets from the Stanford Five-City Project were analyzed to evaluate the effects of demographics, exercise knowledge, and exercise self-efficacy on exercise behavior (Rimal, 2001). The effects of exercise behavior on subsequent knowledge and self-efficacy are also examined. The findings show that in both data sets (year 1-2, N = 1,254 and year 1-6, N = 939), education, income, age, and sex were significant predictors of exercise behavior. Self-efficacy and knowledge also predicted behavior. Prior exercise behavior predicted subsequent knowledge and self-efficacy. Prior knowledge and self-efficacy, in turn, predicted subsequent exercise behavior.

However, knowledge is not always found to have a strong relationship with behaviors. In a study on the relationship between knowledge and lifestyle, only a weak association was found (Coulson, Marino, & Minichiello, 2001). Data derived from a sample of 296 participants were analyzed. Correlations were found between lifestyle and knowledge which were statistically significant ($P<.01$), though the strength of these associations was generally weak. They also found that six variables explained only 20% of the variance in the lifestyle score. These variables were knowledge of interpersonal

relations, knowledge of physical activity, medical knowledge, medical history, self-assessment of general health, and use of alcohol. The results indicate that knowledge by itself does not necessarily ensure that people engage in self-practicing healthy lifestyle behaviors. As the above studies show, knowledge is related to many behaviors. It is a weak factor related to health behavior, however, as shown by inconsistent research results (Gates & DeLucia, 1998; Perlman, Bobak, Steptoe, Rose, & Marmot, 2003; J. E. Stewart, Wolfe, Maeder, & Hartz, 1996).

Self-Efficacy and Health Behaviors

Self-Efficacy and Dietary Behavior

Self-efficacy is a strong predictor of dietary behaviors (E. S. Anderson, Winett, & Wojcik, 2000; Brug, Glanz, & Kok, 1997; Gracey, Stanley, Burke, Corti, et al., 1996; Milligan et al., 1997; Schwarzer & Renner, 2000). In the study of a model of household dietary behaviors based on adults' and children's intrapersonal, interpersonal, and communicative factors, Rimal (2003) collected data from 588 households in the Stanford Five-City Project. The findings revealed that adults' dietary behavior was influenced by their self-efficacy, knowledge, and discussion between adults and children. Children's dietary behavior was influenced by their self-efficacy, knowledge, and use of health information. An investigation of intentions and self-efficacy of 96 physically active university students towards healthy eating showed that an individual's self-efficacy for healthy eating could be explained from the attitudes, intention, perceived behavioral control, and "attitude strength held". Overall, systematic participation in physical activities appeared to be accompanied by a relatively healthier diet, while self-efficacy

had a significant association with maintaining healthy eating behaviors (Bebetsos, Chroni, & Theodorakis, 2002).

Self-efficacy is also conceptualized as the mediator of the gap between knowledge and behavior (Rimal, 2000). To determine whether diet self-efficacy mediated the relationship between diet knowledge and behavior, the data from three cross-sectional data waves spanning 10 years (N = 2,055; 2,026; and 2,068) and two longitudinal data waves spanning four years (N = 1,384 and 1,151) of the Stanford Five-City Project were analyzed. In the cross-sectional data waves, knowledge-behavior correlations were greater among those with higher self-efficacy. In the longitudinal data waves, knowledge-behavior correlations increased among the participants whose self-efficacy increased and decreased among the participants whose self-efficacy decreased.

Self-Efficacy and Physical Activity

There are substantial indications in the research literature that self-efficacy is an important correlate of physical activity participation (DiLorenzo et al., 1998; Dishman, Sallis, & Orenstein, 1985; Duncan & McAuley, 1993; Dwyer, Allison, & Makin, 1998; J. Sallis, Alcaraz et al., 1992; J. Sallis et al., 1989). Longitudinal data from a cohort of 743 10th-grade students from the Stanford Adolescent Heart Health Program were analyzed. Physical activity was found significantly associated with intention to exercise, self-efficacy, stress, and direct social influence after controlling for baseline levels of physical activity and BMI (Reynolds et al., 1990).

The relationship between physical activity self-efficacy and participation in vigorous physical activity by high school students was examined by Allison, Dwyer, and Makin (1999). They hypothesized that self-efficacy would be positively related to

participation in physical education class, other school-related activities, and outside of school. The data were collected from a sample of 1,041 9th and 11th graders from a large metropolitan Toronto school. Analysis indicated that physical activity self-efficacy is predictive of positive physical activity participation.

As indicated in the above research, self-efficacy has a strong relationship with both dietary behavior and physical activity. The direction of the relationship is also clear: the higher one's self-efficacy is with regard to a certain behavior (e.g., healthy dietary behavior or physical activity) the more likely he/she will conduct the behavior (e.g., healthy dietary behavior or physical activity).

Acculturation

Acculturation is commonly used to describe the process by which a racial/ethnic minority adopts the cultural patterns (e.g., beliefs, religion, language) of a dominant/host group (Satia, Patterson, Neuhouser et al., 2002). To study an ethnic minority group such as the Chinese, one cannot ignore the cultural background. It is suggested that acculturation can result in changes in attitudes, beliefs, behaviors (e.g., diet), and values of individuals (Satia, Patterson, Neuhouser et al., 2002). Obesity differences among ethnically diverse children and adolescents can be partly explained by the degree to which individuals are acculturated toward U.S. societal behaviors, attitudes, and values (Winkleby et al., 1994). High levels of acculturation toward the U.S.-majority culture generally correspond to more unhealthy eating behaviors, such as increased consumption of fat (Winkleby et al., 1994).

Acculturation and Dietary Behavior

Compared to physical activity, dietary behavior is more likely tied to cultural influence (Cullen et al., 2002; Cullen, Baranowski, Rittenberry, & Olvera, 2000). Asian immigrants' diet patterns have changed because of the process of immigration (Wei & Read, 1996). Wei and Read (1996) surveyed 124 Asian immigrants (80 men, 44 women) about their food preparation habits, food practices, and nutrition beliefs before and after immigration. Results indicate that the post-immigration diet is a relatively low-fat (23.6% of total calories), high-carbohydrate (56.7% of total calories) and high-fiber (28.5 gm/d) diet. Comparison of the post-immigration diet to the pre-immigration diet showed a significant increase in the intake of cholesterol (from 265.8 to 305.85 gm/d), fat (from 49.21 to 56.49 gm/d), especially in saturated fat (from 14.09 to 18.23 gm/d) and monounsaturated fat (from 15.49 to 19.58 gm/d) intake. Simultaneously, the change in diet showed a decrease in carbohydrate (from 324.9 to 300.3 gm/d) and fiber (from 32.9 to 28.5 gm/d) intake. A qualitative study showed that breakfast was usually the first meal to be "Westernized," largely for reasons of convenience (Satia et al., 2000). Food quality, cost, and availability were some of the most important predictors of dietary change after immigration to the United States (Satia et al., 2000).

Satia and her colleagues (2001) developed two scales to assess dietary acculturation: the Western Dietary Acculturation Scale and the Chinese Dietary Acculturation Scale, measuring Western and Chinese eating behavior, respectively. The findings showed that although the population in the study was a less-acculturated sample, most participants reported some Western dietary practices, such as drinking milk (78%), eating cheese (78%), eating at Western fast-food restaurants (56%), and eating between

meals (72%). In another survey, a questionnaire was administered to a convenience sample of 600 healthy Chinese-Americans (25-70 years old) living in New York City (Liou & Content, 2001). Information was collected on demographic factors, degree of acculturation, food preferences, and some social psychological variables. The findings showed that attitude, overall health concern, and self-efficacy accounted for 58% of the variance in behavioral intention for the entire sample. Attitude, perceived barriers, and self-efficacy accounted for 19% of the variance in the prediction of dietary fat reduction behaviors. In general, a positive relationship was found in the increased predictiveness and the degree of acculturation of the immigrants to American culture. Predictiveness for behavior ranged from 15% for the least acculturated to 34% for the most acculturated. A more significant diet pattern change was found in youth than in older Asian Americans. The younger Asian immigrants had acquired a diet in which the positive aspects of their traditional diets were replaced by the negative aspects of Western diets, which are relatively high in fat and cholesterol, but low in fiber (Wu-Tso, I-Li, & Tam, 1995). Wu-Tso, I-Li, and Tam (1995) assessed dietary patterns of 71 young Asians and 71 older Asians, with each pair residing in the same household, and discovered differences in nutrient intakes between young and older Asians. Three-day dietary records were used as a tool for collecting data. Calcium intake and dietary fiber intake were relatively low in both groups. Additionally, both groups consumed limited amounts of fruits and vegetables. The authors found that younger Asians had a higher-fat diet and consumed more cholesterol than their older counterparts. Based on the findings, younger Asians ate out three times more than the older Asians. Older Asians ate more oriental foods than younger Asians. Younger Asians' diets were more Americanized in that they ate more

fast foods and drank more juices than older Asians. In the process of acculturation, the younger Asians consumed foods that were high in fat and cholesterol, but low in fiber. An early study showed that the second generation immigrant and immigrants with more acculturated patterns of language use gave higher hedonic flavor and prestige ratings to dessert, snack, and fast foods (Hrboticky & Krondl, 1984).

One study indicated that Chinese cultural beliefs play an important role in the dietary practices of Chinese living in North America. To examine the influence of diet-related psychosocial constructs on the dietary practices of Chinese populations living in North America, an interviewer-administered questionnaire was used to collect data from a cross-sectional survey of 244 women of Chinese ethnicity living in the U.S. or Canada (Satia, Patterson, Kristal, Teh, & Tu, 2002). Information was collected on diet-related psychosocial factors (predisposing, enabling, and reinforcing), consumption of foods reflecting Western and Chinese dietary practices, and past and current consumption of fruits, vegetables and fat. The results showed the women, in general, have a strong belief in relationships between diet and health. Western acculturated women were more likely to believe in a relationship between diet and cancer/heart disease. These women also reported that preparing Chinese meals is inconvenient. Women with in-family normative pressure to maintain Chinese eating patterns ate more fruits and vegetables.

Environmental Factors and Health Behaviors

Environmental factors are a construct of SCT and a determinant of health behaviors. It is important to understand which behaviors promote obesity and how the environment encourages those energy intake and energy expenditure behaviors (Hill, Wyatt, Reed, & Peters, 2003). Children's diet and exercise patterns are affected by

numerous environmental factors, including the availability of healthful foods and exercise opportunities in the community and family practices regarding physical activity and food choices.

Physical Environmental Factors and Health Behaviors

Physical Environmental Factors and Dietary Behavior

Food Availability. Research has demonstrated relationships between availability of foods in grocery stores, restaurants, and schools and child consumption of these foods (Hearn et al., 1998; Richter et al., 2000). There has been a tremendous increase in recent decades in the availability of foods for consumption (French et al., 2001; Hearn et al., 1998; Patterson, Kristal, Shannon, Hunt, & White, 1997). One study showed that weekend and total weekly fruit and vegetable consumption was significantly associated with home availability and access while weekday consumption was not (Hearn et al., 1998).

Family environment. Research on how family environment influences children's intake is sparse, though parents play a key role in virtually all food-related decisions among children , although less so among adolescents (Baranowski, 1997). The role of parental influence on the child's diet is an area of research that has generated substantial interest because diet is a major contributor to the development of obesity (Baranowski, 1997). One study found that parents likely influence children's intake of vitamin supplements by controlling availability and accessibility in the home, offering them, modeling consumption, socializing the child's beliefs and attitudes about vitamin supplements, and parenting the child's supplement use behaviors (Nicklas, Baranowski,

Cullen, & Rittenberry, 2001). A study showed that mother's education level is a predictor of offspring nutritional intake (Wachs & McCabe, 2001).

However, the way in which ethnic Chinese parents' or family members' characteristics (e.g. age, sex, and education) impact children's intake is unclear. An early study revealed that Mexican-American mothers with less formal education serve less healthy food and monitor their children's food intake less that those with more education (Olvera-Ezzell, Power, & Cousins, 1990). How parents' or family members' characteristics influence children's health behavior including dietary and physical activity are examined in this dissertation study.

Physical Environmental Factors and Physical Activity

Availability. Access to physical activities or nearby play space, such as the location of parks and schools, and opportunities to participate in games or sports are found to affect sports involvement (Greendorfer & Ewing, 1981; J. Sallis et al., 1990; J. Sallis et al., 1993). One research study revealed that adaptable environmental factors were associated with walking and vigorous activity, especially perceived access to sidewalks and neighborhood attractiveness (Giles-Corti & Donovan, 2002). Spatial access to attractive, public open space was associated with walking. It is suggested that creative supportive environments have the potential to increase walking and vigorous activity (Giles-Corti & Donovan, 2002). Another study examining transportation, urban design, and planning has found associations between physical environment variables and individuals' walking and cycling for transport. Findings showed that residents from communities with higher density, greater connectivity, and more land use mix report higher rates of walking/cycling for utilitarian purposes than low-density, poorly

connected, and single land use neighborhoods. The study suggested that environmental variables appear to account for variance of walking/cycling for transport in addition to socio-demographic predictors (Saelens et al., 2003).

Family environment. Parents who play with their children regularly and provide transportation to activities have more active children (J. Sallis, Alcaraz et al., 1992). McKenzie and his colleagues (1991) found that parental verbal prompting resulted in an increased rate of physical activity. The relationship between a girl's feelings toward exercise and her parents' marital status was important in explaining her high-intensity physical activity participation. For a girl living in a single-parent home, the more positive her feelings toward exercise, the more likely she would participate in physical activity; this relationship was not found among the girls in non-single-parent homes (Robinson, 1999).

Safety. Parents usually worry about whether to permit children to play outside unattended because of concerns about traffic safety in residential neighborhoods. One study surveyed 75 parents (18-54 years old) and 30 non-parents (aged 18-38 years old) on evaluative ratings of six familiar residential neighborhoods. The participants were asked to rate the traffic accident risk to children in these neighborhoods and the strengths attributed to factors (environment, children, parents, drivers, and chance) as causes of traffic accidents. The findings revealed that risk perceptions were related to the rated strengths of the causes. Low-traffic-volume neighborhoods were perceived as less risky than were high-traffic-volume neighborhoods (Gaerling, Svensson-Gaerling, & Valsiner, 1984).

The association between a dangerous neighborhood context and physical activity in children was examined by Romero and his colleagues (2001). They hypothesized that children's perceptions of more neighborhood hazards would be associated with less physical activity, less aerobic fitness, and the children would have a higher body mass index. The findings showed that children from families of lower socioeconomic status perceived significantly more neighborhood dangers. However, contrary to the hypothesis, the perception of more dangers was significantly associated with more reported physical activity. The authors suggested that to further examine the relationship between neighborhood hazards and physical activity, it is important to include assessments of sedentary behavior, parental fear of violence, parental regulation of children's leisure activities, and cost and quality of available play areas and organized sports. However, the study was conducted in a particular neighborhood and the results might not be representative of all neighborhoods. This current study only examines the general relationship between the perceived neighborhood safety and physical activity.

Social Environmental Factors and Health Behaviors

Social Environmental Factors and Dietary Behavior

Reinforcement. Parental socialization strategies can affect a child's food-related knowledge, preferences, and consumption (Hays, Power, & Olvera, 2001). Parental use of direct control strategies to encourage eating is positively associated with the amount of time the child spends eating and the child's relative weight (Klesges et al., 1983). Anliker, Laus, Samonds, and Beal (1990) reported that mothers who chose foods for their preschool children to consume based on healthful considerations rather than on taste had more nutrition knowledge and had children who ate more healthful diets (fewer "empty"

calories, lower fat, and more vitamin A). Similarly, another study found that mothers who were more likely to select foods for healthful reasons had children whose diets were significantly lower in calories, fat, saturated fat, and sucrose, and higher in fiber and vitamin A (I. R. Contento et al., 1993).

Girls reported significantly greater perceived reinforcement for healthy eating than did boys in one study (Edmundson, Parcel, Feldman et al., 1996). Findings suggested that parental encouragement to lose weight was a more significant predictor of a daughter's "dietary restraint" than her parents' own "dietary restraint" levels. Mother influence variables added significantly to a regression equation after father influences had been entered, but the reverse was not the case (Wertheim, Mee, & Paxton, 1999). Mothers appear to have more impact on children's food intake. There was little difference between the mother's control of boys' and girls' eating, but the patterns of correlation were different. In particular, mothers' "dietary restraint" predicted the degree of monitoring of daughters', but not sons', eating behavior (Tiggemann & Lowes, 2002).

A comparison of the relative impact of maternal and peer influences on eating problems among Japanese adolescent girls revealed that at higher grade levels there was a greater relative impact of peer interactions on the girls' eating problems. The difference between grades nine and 10 was most pronounced. For girls in grades 10 and 11, peer influence was stronger than maternal influence, whereas maternal influence was stronger than peer influence among girls in grades eight and nine (Mukai, 1996).

Social Environmental Factors and Physical Activity

Social Support. Family, peers, and school support clearly affect physical activity levels in children (Taylor et al., 1994). Many studies, both cross-sectional and

prospective, have examined the relationship between physical activity and social support and have found a strong positive association (DiLorenzo et al., 1998; J. Sallis, Hovell, & Hofstetter, 1992). Friend and family support have been consistently found to influence participation in physical activity across a wide range of population groups, while lack of social support from family and friends is associated with lower levels of physical activity (Stahl et al., 2001).

Stonecipher (2000) examined the perceived social support for physical activity among different ethnic groups. In this study, a survey was administered to 254 youths aged 16-26 years. Participants were Caucasian (57%), Asian (15%), African American (14%), Hispanic (10%), and Native American (4%). The results identified a significant effect of ethnicity for support from both fathers ($P < .001$) and mothers ($P < .001$) for physical activity. Asians perceived significantly more support from their fathers and mothers compared with Caucasians or Hispanics. In addition, compared with Hispanics, Asians reported significantly more role modeling for physical activity by family and friends. For this population, peer support for physical activity was perceived as more salient than support from family. There were no significant differences among ethnic groups regarding peer support for physical activity. These results suggest that for young adults, levels of current physical activity and social support for physical activity vary greatly among ethnic groups. Although this study focused on young adults, it indicated that understanding motivational determinants is important, especially the family's influence of physical activity among Asian subpopulations.

Personal Factors and Environmental Factors

Social Influences and Knowledge/Self-Efficacy

Few studies have been done solely to study the relationship between social influences and knowledge/self-efficacy. Most of the studies examined the relationship when exploring health behaviors. Studies showed that knowledge or self-efficacy may mediate between social influences and healthy eating habits of adults, for example, to "choose appropriately" and "avoid overeating" (Duncan & McAuley, 1993; Shannon, Bagby, Wang, & Trenkner, 1990; Slater, 1989) Self-efficacy functions as a mediator between friend (but not family) support and eating behavior (Shannon et al., 1990). Additionally, knowledge mediates between social influences and self-efficacy in the prediction of health-related behaviors such as eating habits (Slater, 1989). Family social influences were expected to be greater for children than for adults, because children are dependent on parents for access to food and support of exercise-related activities (Baranowski, 1997). Ievers-Landis and her colleagues (2003) developed and tested a model based on Bandura's Social Cognitive Theory to predict healthy lifestyle behaviors for the prevention of osteoporosis. The results showed that family social support, perceived self-efficacy for eating a calcium-rich diet, and knowledge of weight-bearing physical activity (WBPA) significantly predicted calcium intake. Friend and family support for exercise predicted WBPA. Self-efficacy partially mediated the relationship between family support and calcium intake.

Parent's Education level and Children's Knowledge and Self-Efficacy

There is no direct evidence that indicates there is a relationship between parental education level and children's health knowledge. However, one study showed that

intakes of total fat, saturated fat, monounsaturated fat, and cholesterol decreased as parents' education levels increased (Xie, Gilliland, Li, & Rockett, 2003). Children from families with parents who had a higher educational attainment were more likely to meet the recommendations of dairy products, fruits, and vegetables (Xie et al., 2003). Similarly no direct evidence shows the relationship between a parent's education level and children's self-efficacy. The goal of a health promotion program is to reduce people's negative health behaviors and increase positive health behaviors. The personal factors and environmental factors are expected eventually to influence people's behavior. Therefore, the current study focused more on the relationships between personal factors/environmental factors and behaviors than on the interactions between personal factors and environmental factors.

Issues of Measurement

Measurement of Obesity

Accurate assessment of body composition is important in many areas of obesity research. Measurement of body composition is extremely challenging, because no direct method exists other than in vivo neutron activation analysis, which has very limited availability, and chemical analysis of the cadaver, which was useful for animal studies only (Goran, 1998). The lack of direct methods has led to development of various models and indirect methods for estimation of fat and fat-free mass, all of which are imperfect and require a number of assumptions, and many of which require age-specific considerations, such as the BMI (Goran, 1998). Some techniques have been developed for use in younger prepubescent children for specialized research-based techniques such as total body water (Goran et al., 1993), dual energy X-ray absorptiometry (DXA)

(Pietrobelli, Formica, Wang, & Heymsfield, 1996), total body electrical conductivity (Fiorotto, Cochran, Funk, Sheng, & Klish, 1987), and total body potassium (Schaefer, Georgi, Zieger, & Scharer, 1994). The usefulness of these tests, however, is limited by the practical availability. Other more convenient and widely available techniques include bioelectrical resistance (Goran et al., 1993), skinfolds (Slaughter, Lohman, & Boileau, 1984), and other clinical anthropometric evaluations (e.g., weight for height, ideal body weight, body mass index) (Deurenberg & Yap, 1999).

Body fat can be assessed using either highly accurate laboratory techniques or using simple estimation techniques, which though less accurate, can also be applied in field conditions. For population studies, the World Health Organization defines cut-off values for obesity based on the body mass index (BMI): weight/height squared (kg/m^2) (Deurenberg & Yap, 1999). Generally, for adults, if the BMI exceeds 25 kg/m^2, a subject is considered to be overweight, and if the BMI exceeds the value of 30 kg/m^2, a subject is considered obese (Deurenberg & Yap, 1999). An expert consensus panel convened by the Maternal and Child Health Bureau suggested that a BMI greater than or equal to 95% for age and gender should define obesity (Barlow & Dietz, 1998). BMI provides a guideline based on weight and height to determine underweight and overweight status and is used differently with children than it is with adults. As children grow, their "body fatness" changes over the years. The interpretation of BMI depends on the child's age. Additionally, girls and boys differ in their "body fatness" as they mature. Therefore, BMI-for-age is plotted on gender-specific growth charts (Centers for Disease Control and Prevention, 2000a). Each of the CDC BMI-for-age gender specific charts contains a series of curved lines indicating specific percentiles. Based on the current

recommendations of expert committees, children with BMI values in the 5th up to the 85th percentile are considered as acceptable in weight; from the 85th to 95th percentile, children are at risk of being overweight, and at or above the 95th percentile of the sex-specific BMI growth charts, children are categorized as overweight (Centers for Disease Control and Prevention, 2000a).

However, even with a consensus on the definition of obesity, studies vary with regard to use of measured versus self-reported height and weight to calculate BMI. Studies of adults have demonstrated a high correlation between self-reported and measured height and weight (Nieto-Garcia, Bush, & Keyl, 1990; A. Stewart, Jackson, MA, & Beaglehole, 1987), although use of BMI based on self-report indexes to define obesity as a categorical variable is considered unreliable in adults. Some studies suggest that adolescent reports of height and weight are valid (Davis & Gergen, 1994), while others have raised concern about the accuracy of adolescent reports of both height and weight (Crawley & Portides, 1995; Fortenberry, 1992; Shannon, Smiciklas-Wright, & Wang, 1991).

Measurements of Behaviors

Precise methods of dietary assessment, such as 24-hour recall food records, food frequency questionnaires, and direct observation are desirable but have high cost, and burden the respondents and cannot be easily administered in a school setting (McPherson, Hoelscher, Alexander, Scanlon, & Serdula, 2000). There are few readily available dietary behavior questionnaires; of these, many do not have published estimates of validity and reproducibility in school-aged children (Brener, Collins, Kann, Warren, & Williams, 1995) and do not adequately assess key nutrition and diet-related topics (I.

Contento, 1991; McPherson et al., 2000; Stevens et al., 1999). For example, the Youth Risk Behavior Survey (YRBS) addresses nutrition and body weight issues with 14 items (Brener et al., 1995; Brener et al., 2002), while other instruments have been designed for specific purposes, such as assessment of fat, fruit, and vegetable intake (Edmundson, Parcel, Feldman et al., 1996; Stevens et al., 1999) or calcium (I. Contento, 1991). Many nutrition-related questionnaires do not include physical activity items, although it is important to address energy expenditure as well as energy intake. No questionnaire has been developed to measure ethnic Chinese children's dietary behavior. Consequently, the 24-hour diet recall is used in this study to obtain relatively precise information.

Similar issues exist in the measures of physical activity. Kohl, Fulton, and Caspersen (2000) conducted a comprehensive review of reliability and validity of physical activity assessment techniques used for children and adolescents. Six categories of techniques have been commonly used including self-reporting, electronic or mechanical monitoring, direct observation, indirect calorimetry, doubly labeled water, and direct calorimetry. Each type of technique carries certain strengths and weaknesses. Self-reporting is less expensive but does not work well with children less than 10 years old. Direct observation and mechanical monitoring may be the best method for young children, and interviewer assistance may enhance the validity of recall and reporting among older children and adolescents. Electronic monitoring is the best choice for detecting and assessing patterns of physical activity (especially in measures of intensity) over an extended period (several days, for example). The doubly labeled water technique, while offering an accurate assessment of total energy expenditure, does not provide an estimate of energy expenditure resulting from physical activity or an

evaluation of the intensity of the activity and thus has limited applications in physical activity assessment. Except for the self-report, all other methods demand more time and are relatively expensive to administer. Therefore, researchers suggest that the choice for a particular method of activity assessment among children and adolescents depends largely on the design of the study and the age of the participants.

Measures of Environmental Factors

Efforts to measure environmental factors related to dietary behavior and physical activity are relatively new. Although there are many empirical studies of physical activity and nutrition that have measured individual behavior change, few studies were found that measured environmental factors. This section discusses measures of environmental factors relevant to physical activity and nutrition among youth.

Richter et al. (2000) reviewed 16 selected community-based studies related to physical activity or nutrition among youth and concerned an aspect of the environment. Most of them, 11 of the 16, reported on the reliability of the measures including inter-rater, test-retest, or internal consistency; six of the 16 studies showed some level of validity (Richter et al., 2000). Richter et al. (2000) summarized that the usefulness and validity of these environmental measures are in part determined by how well they correlate with accepted measures of behavior. For instance, a community "walkability" scale.which is operationalized as number of sidewalks, controlled walking in the street, etc., may be reliable and accurately measure how easy it is to walk in a community. The next level of validity could be based on how well the scale correlates with actual levels of walking.

Overall, measures of physical environments must be specified to a certain behavior and certain region. The measures of physical environmental factors in this study are developed based upon the review of the prior studies and actual situations in the local region. As indicated, environment plays an important role in people's behaviors, while personal factors intervene when people live in the same or similar environment.

Measurement of Acculturation

The most common approaches to measuring acculturation that appear in the literature are single-item measures of general acculturation. Single-item measures usually focus on items such as length of residence in the host country, language proficiency, generation level, and so forth. The major limitation of the single-item measure is that it is quite general (Satia, Patterson, Neuhouser et al., 2002). Acculturation scales are relatively more comprehensive and measure several facets of exposure to the host country; therefore, they are likely to more accurately classify one's level of acculturation. However, most of these scales have been validated against single-item measures and demographic characteristics rather than any type of "gold standard", and the validation samples usually consisted of homogenous, nonrepresentative populations (J. Anderson, Moeschberger, Chen, Kunn, et al., 1993; Cuellar, Harris, & Jasso, 1980; Marin, Sabogal, Marin, Otero-Sabogal, et al., 1987; Suinn, Rickard-Figueroa, Lew, & Vigil, 1987). Currently there is no measure available to explore the acculturation of Chinese children. Based upon these findings from review of the literature, therefore, this study uses the s scale developed by Wong-Kim, Sun, & DeMattos (2003) to yield a general assessment of acculturation.

Summary

Much of the research on factors relevant to health behaviors has relied upon descriptive research rather than quasi-experimental or experimental designs because of the limitations on time and money and the hardship of collecting data. In addition, most of the research employs cross-sectional design rather than longitudinal designs, neither of which can establish causal relationships between the related factors. Consequently, interpretation of the results must be conservative and with a great degree of caution. The self-report questionnaire is the most commonly used method to collect data. This method results in several threats to internal validity such as social desirability bias. The use of probability sampling in health behavior research is difficult to obtain and a majority of the studies have employed non-probability sampling. This sampling will compromise the ability to generalize the results to populations beyond the one being studied. One major concern in health behavior research is the sample size for minority groups (Cowell & Marks, 1997). Due to the relatively small numbers of minorities and their low response rates, measuring their health behaviors is problematic. To counterbalance the low numbers of minorities, the researcher needs to over-sample in order to conduct the research.

Empirical studies show that physical activity and dietary behaviors are related to environmental and personal factors as the SCT predicts. The current study addressed some gaps found in the literature such as physical environmental factors. The SCT guided the research questions, and the results of previous studies helped generate hypotheses for this current study.

CHAPTER III

METHODOLOGY

This chapter describes the purpose of the study, research questions and relevant hypotheses, research design, data collection, and proposed data analysis.

Purpose

The purpose of this study is to test the ability of Social Cognitive Theory (SCT) to model how well personal and environmental factors relate to the health behaviors of Chinese children in three cities in the Hampton Roads area. SCT defines human behavior as a triadic, dynamic, and reciprocal interaction of personal factors (including cognition), behavior, and the environment (Bandura, 1977, 1986, 1997). The expected predictors for health behaviors include personal factors, such as demographics, acculturation, knowledge and self-efficacy, and environmental factors, including physical environment, reinforcement and social support. The health behaviors addressed are dietary behavior and physical activity. The research questions and hypotheses are structured based on SCT, and the directions if hypotheses are based upon the review of previous studies on factors related to health behaviors.

Research Questions and Hypotheses

The research questions addressed by this study and the relevant hypotheses are presented as follows:

1. Does the SCT model predict Chinese children's dietary behavior and physical activity?
    a. Personal factors (age, gender, acculturation, knowledge and self-efficacy) and environmental factors (availability, family structure, family

member's/guardian's providing after school care, social reinforcement, and perceived support) will predict Chinese children's dietary behavior.

b. Personal factors (age, gender, acculturation, and self-efficacy) and environmental factors (availability, family structure, family member's/guardian's providing after school care, social reinforcement, and perceived support) will predict Chinese children's physical activity.

2. How are demographic variables associated with Chinese children's dietary behavior and physical activity?

   a. What is the pattern of the dietary behaviors of Chinese children by age and gender?

      i. Older children will be more likely to have unhealthy dietary behaviors than younger children.

      ii. Boys will be more likely to have unhealthy dietary behaviors than girls.

   b. What is the pattern of physical activity of Chinese children by age and gender?

      i. Younger children will be more likely to be physically active than older children.

      ii. Boys will be more likely to be physically active than girls.

3. How is acculturation associated with Chinese children's dietary behavior and physical activity?

   a. Children who are less acculturated will be more likely to have healthy dietary behavior than children who are more acculturated.

b. Children who are less acculturated will be more likely to be physically active than children who are more acculturated.

4. How are knowledge and self-efficacy associated with Chinese children's dietary behavior and physical activity?
    a. How is knowledge associated with Chinese children's dietary behavior?
        i. Children with a higher knowledge score will be more likely to have healthier dietary behaviors.
    b. How is self-efficacy associated with Chinese children's dietary behavior and physical activity?
        i. Children with a higher self-efficacy score will be more likely to have healthier dietary behavior.
        ii. Children with a higher self-efficacy score will be more likely to be physically active.
5. How are physical environmental factors associated with Chinese children's dietary behavior and physical activity?
    a. How is food availability at home associated with children's dietary behavior?
        i. Children who have healthy food available at home will be more likely to have healthy dietary behaviors than children who do not have healthy food available at home.
        ii. Children who have fast food available at home will be more likely to have unhealthy dietary behaviors than children who do not have fast food available at home.

b. How is the availability of playgrounds and recreation centers associated with children's physical activity?
    i. Children who have playgrounds available close to home will be more likely to be physically active than children who do not have playgrounds available close to home.
    ii. Children who have recreation centers available close to home will be more likely to be physically active than children who do not have recreation centers available close to home.
c. How is neighborhood safety associated with children's physical activity?
    i. Children who live in a perceived safe neighborhood will be more physically active than children who live in a perceived unsafe neighborhood.
d. How is children's family structure and size associate with children's dietary behavior and physical activity?
    i. Children living in a big family will be more likely to have healthy dietary behaviors than children in a small family.
    ii. Children living in a big family will be more likely to be physically active than children in a small family.
    iii. Children living in a three-generation family will be more likely to have healthy dietary behaviors than children in a two-generation family.
    iv. Children living in a three-generation family will be more likely to be physically active than children in a two-generation family.

e. How is parents' education level associated with children's dietary behavior and physical activity?

   i. Children whose parents have a college or above education will be more likely to engage in healthy dietary behaviors than children whose parents have less than a high school education.

   ii. Children whose parents have a college or above education will be more likely to be physically active than children whose parents have less a than high school education.

f. How is family member's/guardian's providing after school care associated with children's dietary behavior and physical activity?

   i. Family members/guardians providing after school care will be positively associated with children's healthy dietary behavior.

   ii. Family members/guardians providing after school care will be positively associated with children's increased physical activity.

6. How are social environmental factors associated with Chinese children's dietary behavior and physical activity?

   a. How is perceived social reinforcement associated with children's dietary behavior?

      i. Perceived parents' social reinforcement will be positively associated with children's healthier dietary behavior.

      ii. Perceived teachers' social reinforcement will be positively associated with children's healthier dietary behavior.

iii. Perceived friends' social reinforcement will be positively associated with children's healthier dietary behavior.

b. How is the perceived support associated with children's physical activity?

i. Perceived support will be positively associated with children's physical activity.

7. How are personal factors related to environmental factors?

a. How is children's knowledge and self-efficacy associated with perceived support and social reinforcement?

i. Social reinforcement will be positively associated with children's knowledge.

ii. Social reinforcement will be positively associated with children's dietary self-efficacy.

iii. Perceived support will be positively associated with children's physical activity self-efficacy.

b. How is parent's education level associated with children's knowledge and self-efficacy?

i. Parent's education level will be positively associated with children's knowledge.

ii. Parent's education level will be positively associated with children's dietary self-efficacy.

iii. Parent's education level will be positively associated with children's physical activity self-efficacy.

Research Design

An observational cross-sectional survey research design was employed. A cross-sectional study can establish associations between many variables while using statistical controls. It also ensures a rapid turnover of data (Trochim, 2000). However, no causal relationship can be derived because the data are collected at one point in time (Trochim, 2000). The major threat to internal validity of this design is social desirability bias, i.e., participants in the study may want to present themselves to evaluators in the best possible light. Data were collected in the form of self-administrated questionnaires among American Chinese children residing in Norfolk, Chesapeake, and Virginia Beach.

Population and Sample

Population and Setting

According to the 2002 census, the Norfolk Metropolitan Statistical Area has a total population of 1,551,351 people, with 3,937 Chinese living in this area (U.S. Census Bureau, 2002b). Among them, 380 live in Chesapeake, 577 live in Norfolk, and 1,557 live in Virginia Beach (U.S. Census Bureau, 2003). The number of Chinese children 5-19 years old living in this area is 409 (211 boys and 198 girls) (U.S. Census Bureau, 2003).

The Tidewater Chinese Weekend School is a voluntary school initiated and sponsored in 1982 by a group of enthusiastic parents living in this area. The purpose of this school is to promote Chinese language and cultural education, help the younger generation preserve and appreciate Chinese heritage, and create educational and cultural exchanges between American and Chinese people. The fall semester starts in late August and ends in December, and the spring semester begins in January and finishes in May.

The classes are held on the first to third floors of the Batten Arts and Letters Building at the Old Dominion University from 1 p.m. to 4 p.m. every Saturday. Students are assigned to different classes based on their proficiency in Chinese. The minimum age requirement is five years. No prior knowledge in Chinese is required. In addition to Chinese language, Chinese word processing is also part of the curriculum. Other school activities include Chinese culture classes, cultural events, and the publication of the school news. Students of this school come from Norfolk, Chesapeake and Virginia Beach.

Sampling

Snowball sampling was utilized in this study. Snowball sampling is a special non-probability method used when the desired sample characteristic is rare or when the target population is inaccessible or hard to find (Trochim, 2000). The sampling method began by the identification of people who meet the criteria for inclusion in the study. Then the researcher asked the selected people to recommend others whom they may know who also meet the criteria. Although this method may not lead to representative samples, it is used when there is no readily available sampling. Snowball sampling relies on referrals from initial subjects to generate additional subjects, which comes at the expense of introducing bias because the technique itself reduces the likelihood that the sample will be a representative sample of the population (Trochim, 2000). Therefore, the researcher needs to be conservative in the interpretation of the study results.

The criterion for inclusion eligibility for Chinese children (age 5-18 years old) to participate was living in the United States of America for at least one year. In Fall 2003, 92 Chinese-American children aged from five to 18 years old were enrolled in this school.

The 92 students in the Tidewater Chinese School were used as an intact group. The expected comparison group, children not in the school, was recruited through advertisement and referral. A brief written description of the study and information, including how to contact the researcher, was distributed to Chinese families in these three cities through an American-Chinese Community newsletter and word of mouth. The principal of the Tidewater Chinese Weekend School was contacted and gave approval for the researcher to collect data in the school (Appendix A). The expected numbers of children in the weekend school and not in the weekend school were both 50. The data were collected upon parents' signed informed consent and children's assent.

Description of the Sample

Fifty-five children from Tidewater Chinese Weekend School and 30 children not attending the Chinese weekend school constituted the respondents for this study. The representative rate of the population in this area was 20% (84/409). Children's ages ranged from six to 18 years old, with a mean age of 10.5 (SD=3.7). There is a significant difference ($t=-2.872$, $P<.01$) of age between the Chinese school group and the non-school group. Children who did not attend the Chinese school (12.1 years old) were older than the children who attended the Chinese school (9.6 years old). Overall, 36 (42.9%) were girls and 48 (57.1%) were boys. Among the Chinese school group, 26 (48.1%) were girls, and 10 (33.3 %) were girls for the non-Chinese school group. Eighty-three percent of all the children have siblings in the family. The children are in regular school from kindergarten to grade 12.

Instrumentation

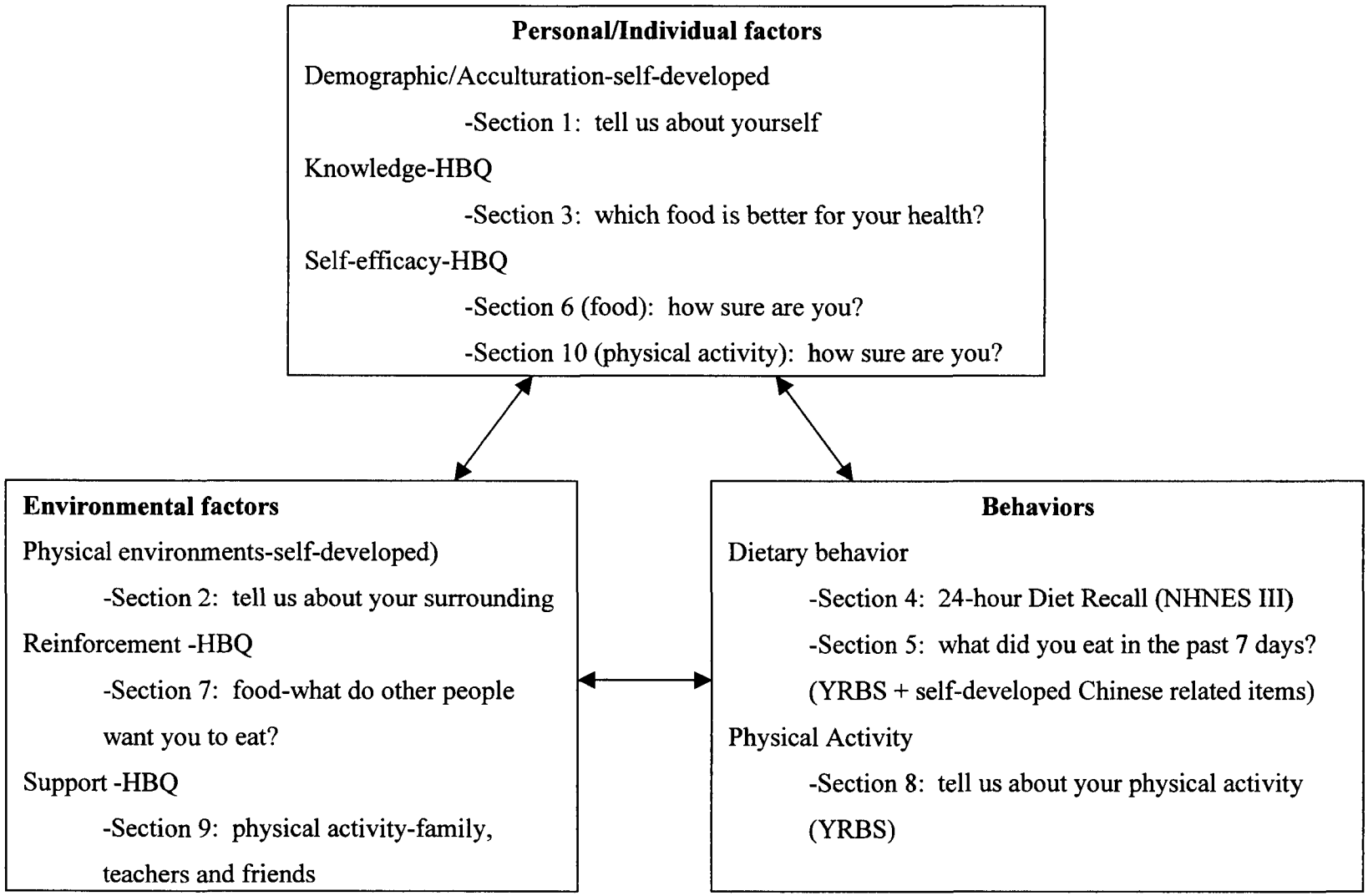
Development of the Instrument

Based on Social Cognitive Theory, the instrument of this study included the following categories: personal factors, environmental factors and behaviors. The instrument map, built upon the SCT model, is shown in Figure 4. The whole questionnaire consisted of 10 sections labeled 1-10 that are based on literature review or adapted from the Health Behavior Questionnaire (HBQ) and the Youth Risk Behavior Survey (YRBS). The complete questionnaire is in Appendix B. The main instruments used for the current study, HBQ and YRBS, were selected because these two instruments have been shown to have reasonable reliability (Centers for Disease Control and Prevention, 2002; Edmundson, Parcel, Perry, & Feldman, 1996). However, the reliability of YRBS 2003 had not been examined or published at the time when the questionnaire was developed. Some sections of HBQ show relatively low reliability. This study tested the reliability and explored the usefulness of the two surveys. The reliability will be discussed separately in the description of the instrument. In addition, the content of the two surveys are complementary, in that YRBS measures actual physical activity, while HBQ measures psychosocial constructs.

The HBQ was developed for the Child and Adolescent Trial for Cardiovascular Health (CATCH) to measure psychosocial constructs related to diet and physical activity among elementary schoolchildren (Edmundson, Parcel, Feldman et al., 1996). The scales were based on the SCT. Several SCT constructs were considered for the assessment. The constructs measured by the HBQ are usual food consumption, dietary knowledge, positive support for physical activity, negative support for physical activity, perceived

social reinforcement for healthy food choices, dietary self-efficacy, and physical activity self-efficacy. The YRBS is conducted by the CDC every two years to determine the prevalence of health risk behaviors, assess the trend of health risk behaviors over time, and examine the co-occurrence of health risk behaviors among young people (Centers for Disease Control and Prevention, 2000b). HBQ was designed for children as young as third grade, while YRBS was developed for high school students. The target population of the current study is Chinese children 6-18 years old.

Figure 4: The Instrument Map Based Upon SCT Model:



The survey instrument used in this study was developed by adapting sessions from HBQ and YRBS. A draft copy of the instrument was sent to an expert panel that consisted of a physician (Chinese), a chef (Chinese), a registered nurse (American) and a speech-language pathologist (American) for comment on the content. According to the comments, typical popular Chinese food was narrowed down to tofu and rice and was suggested to be added into past 7-day dietary behaviors. An instructor/proctor was recommended to be present for reading the instrument for children under nine years old. Pictures of food content were also encouraged to be shown to the children younger than nine years old. Based on the committee chair's comment, the title of the dietary behaviors section in HBQ was changed from "what food do you eat most often" to "what food do you eat most often at lunch on school days?" The modified instrument was sent to four children 6-10 years old, in Kansas City, Kansas, as an informal pilot study. The major feedback on the instrument is the length of the questionnaire. The average time for children to finish it is about 50 minutes. No content has been changed since the informal pilot study. All the suggestions concerning questionnaire administration are adopted and will be included in the protocol. A formal pilot study has been done and the results are presented in the data collection procedure section.

Description of the Instrument

Section 1: Demographics and Acculturation-"tell us about yourself." This section was developed by the researcher based on information identified in the literature as having possible significance. This 14-question section includes six questions relating to demographics and eight questions concerned with acculturation.

Section 2: Physical Environment-"tell us about your surroundings." This section was also developed by the researcher based on information identified in the literature as having possible significance. This 12-question section includes information relating to food availability, availability of playgrounds and recreation centers, safety of neighborhood, family structure and size, family members or guardians providing after school care, parents' education level, and lunch source.

Section 3: Dietary Knowledge-"which food is better for your health?" This 13-item questionnaire was adapted from HBQ to measure students' knowledge about healthy foods, i.e., those foods with lower fat and lower sodium (Edmundson, Parcel, Feldman et al., 1996). Due to the controversy of the health benefit of margarine versus butter, the question of margarine and butter was removed from HBQ (Zock & Katan, 1997). Students will be asked to identify which food was "better for your health", for example, "whole wheat bread or white bread, which choice was more healthy (lower fat, lower sodium) than the other option". The Cronbach's α was tested as 0.76 for third grade students and 0.78 two years later when they were in fifth grade (Edmundson, Parcel, Feldman et al., 1996). Note that the third grade and fifth grade information mentioned in the following paragraphs indicate the same group information.

Section 4: Dietary Behavior- 24-hour diet recall. This form is adapted from that used to collect data in National Health and Nutrition Examination Survey III (Smiciklas-Wright & Guthrie, 1995). This form asks the subjects to describe the type and amount of food and beverage they consumed in the past 24 hours. Time and place of food consumption are also asked. One major limitation is the accuracy of the 24-hour diet recall (Smiciklas-Wright & Guthrie, 1995). People may not be able to remember what

they ate or estimate how much they ate. This issue may be salient in the current study because the target population is children under 18 years old, and these children may lack the ability to recall food eaten or may not be aware of everything that they ate.

Section 5: Dietary Behavior-"what did you eat in the past 7 days?" This 12-item section was adapted from Youth Risk Behavior Survey (Centers for Disease Control and Prevention, 2003) to assess overall children's food intake in the past week. Six of the questions address fruit and vegetable consumption and one addresses milk consumption. Based on information identified as having possible significance for Chinese food intake in the literature and from the expert panel, tofu and rice were added as question 8 and question 9. Questions 10-12 were added to explore how much high-fat or high simple carbohydrate-intense food such as chips, ice cream, or candy a child consumes. The sample question is "During the past 7 days, how many times did you drink 100% fruit juices such as orange juice, apple juice, or grape juice?" The subject is then asked to choose one of the following seven responses "I did not drink 100% fruit juice during the past 7 days; 1 to 3 times during the past 7 days; 4 to 6 times during the past 7 days; 1 time per day; 2 times per day; 3 times per day; 4 or more times per day." No reliability was reported for YRBS 2003.

Section 6: Dietary self-efficacy-"how sure are you about your food choice?" The 15-item scale adapted from HBQ was to measure the children's self-efficacy to choose foods lower in fat and sodium (Edmundson, Parcel, Feldman et al., 1996). The scale used a 3-point ordinal response set (i.e., not sure, a little sure, very sure) for each item. The students will be asked to choose between two foods or preparation techniques, wherein one of the foods was more healthful, e.g. ''How sure are you that you can eat cereal

instead of a donut?'' The Cronbach's α for this scale was acceptable (third grade α 0.83; fifth grade α 0.87) (Edmundson, Parcel, Feldman et al., 1996). The Cronbach's α of the dietary self-efficacy scale calculated in the current study is .86.

Section 7: Social reinforcement for healthy food choices- "what do other people want you to eat?" This dichotomous forced-choice 21-item scale, adapted from HBQ, is to measure perceived social reinforcement from family, teachers, and friends for healthy foods (Edmundson, Parcel, Feldman et al., 1996). The Cronbach's α for the total scale was acceptable (third grade α 0.86; fifth grade α 0.89) (Edmundson, Parcel, Feldman et al., 1996). Students will be asked whether or not their family members wanted them to eat the lower fat or lower sodium food presented in the question, e.g., apples instead of cookies. In addition, the scale measures students' perception of social reinforcement from teachers and friends for eating the same healthy foods used in the family items. A sample item is "Who wants you to eat lots of fruits and vegetables? Your parents (yes/no)? Your teachers (yes, no)? Your friends (yes, no)?" The Cronbach's α (third and fifth grade, respectively) for each source of social reinforcement are lower than that of the total scale: social reinforcement from family (0.58; 0.73) teachers (0.74; 0.87), and friends (0.67; 0.83) (Edmundson, Parcel, Feldman et al., 1996). The dietary social reinforcement score is dichotomous, but separated by support source. The Cronbach's α of the parent's reinforcement scale calculated in the current study is .74, and .87 for teacher's reinforcement, and .73 for friend's reinforcement.

Section 8: Physical activity-"tell us about your physical activity." This 7-item scale was adapted from the YRBS to measure participation in physical activity, physical education classes, sports teams, and television watching (Centers for Disease Control and

Prevention, 2003). A sample question for this section is: "On how many of the past 7 days did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?" The subjects will be asked to choose one answer from 0-7 days. No reliability is reported concerning the 2003 version of YRBS.

Section 9: Perceived support for physical activity from parents, teachers and friends. This section, adapted from HBQ, includes two subscales: an 11- item positive support for physical activity subscale (third grade α 0.68; fifth grade α 0.67) and a 7-item negative support subscale (third grade α 0.60; fifth grade α 0.56) (Edmundson, Parcel, Feldman et al., 1996). The dichotomously scored (yes/no) items are to measure perceived support (positive or negative) for physical activity among family members, teachers, and friends. A sample question is "One or both of my parents or guardians do exercises with me like running, jogging, dancing, or skating". The Cronbach's α of the social support scale calculated in the current study is .75.

Section 10: Physical activity self-efficacy-"how sure you are about your physical activity?" The section, adapted from HBQ, is comprised of five items and uses the similar 3-point ordinal response set applied to the dietary self-efficacy scale (Edmundson, Parcel, Feldman et al., 1996). These items measure children's confidence in their ability to participate in various age appropriate aerobic activities. A sample item from this scale is "How sure are you that you can be physically active 3-5 times a week?" The standardized coefficient α for this scale was acceptable (third grade α 0.67; fifth grade α

0.69) (Edmundson, Parcel, Feldman et al., 1996). The Cronbach's α of the dietary self-efficacy scale calculated in the current study is .76.

Protection of Human Subjects

Subjects and their parents were provided with a written letter describing the study. Parents and children signed a consent form if they agreed to participate. Also, they were provided contact information to reach the researcher and faculty advisor for questions they might have considering the study. All data were treated as confidential and stored in a secure locked place to which only the researcher had access. Each subject was assigned a code, and all the questionnaires were numerically coded with no identification appearing on the survey sheets. Consent and assent forms were stored separately from the questionnaires. Permission to conduct research was granted by the Human Subject Institutional Review Board of Old Dominion University on May 20, 2003. The research was conducted from May 20, 2003 to May 20, 2004. The surveys will be destroyed five years after completion of the dissertation.

Data Collection Procedure

Pilot Study

The pilot study for this survey was conducted in two local neighborhoods. This group consisted of 12 American children. Those children were not included in the sample as they were not ethnic Chinese. The reasons for choosing American children for the pilot study were twofold. First, the target population, Chinese children, is a very small minority group. Choosing children other than Chinese for the pilot study would not jeopardize the possibility of obtaining a bigger sample of the small target population for the dissertation research. Second, the purpose of the pilot study was to test how well the

survey works for the children and whether or not the children could understand and finish it. Therefore, the difference between the ethnicities was not an issue for the pilot study.

The survey was given to six children in one neighborhood. The initial response rate was 67% (four out of six). The age range of the children who finished the survey is 11-15 years old. The average time to finish the questionnaire, not including the 24-hour diet recall, 22 minutes (ranging from 15 minutes to 30 minutes). The younger the child, the longer it took her/him to finish the questionnaire. The average time of to finish the 24-hour diet recall form was 11 minutes (ranging from seven to 15 minutes). The average time to finish the complete survey was 32 minutes. The questions seemed to be well understood, except the youngest children skipped most questions of Section 4 "what foods do you eat most often at lunch on school days?" However, no children had difficulty finishing the 24-hour diet recall form. The whole original section 4 was removed according to the committee's recommendation, and the 24-hour diet recall form was added in as the new section 4. No other changes were made to the questionnaire following the pilot study.

Then the survey was given to the second group, which consisted of six children ages 8-18 years old, in another neighborhood. Five of them (83%) completed and returned the survey. The average time of finishing the 24-hour diet recall form was seven minutes, ranging from five to eight minutes. The average time to finish the complete survey was 31 minutes, ranging from 20 to 25 minutes. Similar to the first pilot group, the younger the child was, the longer it took her/him to finish the questionnaire. The questions seem to be well understood, except the youngest children needed one adult's help to finish the survey. No change was made after the second group pilot study.

Data Collection Part A

Time and Place

Data collection part A was scheduled for November 8, 2003, which was the Chinese Health Fair Day (11:30 am-2 pm). The Tidewater Chinese Weekend School provided places for the Health Fair and for the researcher to administer the questionnaire. In order to avoid overcrowding and to maintain order at the Chinese Weekend School, the children attending the school were asked to stay in the classrooms the first hour of the Health Fair.

Questionnaire Distribution and Administration

Six volunteer students in the Urban Health Services Program were trained to help administer the questionnaire. All the Chinese children enrolled in the Tidewater Chinese Weekend School for the Fall 2003 semester and the children who were recruited through the American-Chinese Association were invited to participate. Only those children with the signed informed consent forms from the parents or guardians participated. According to the CATCH program data collection experience(Edmundson, Parcel, Feldman et al., 1996), the children were divided into two groups according to their age, which was group A (under 9 years old) and group B (equal or greater than 9 years old). For the younger group, the proctor read out the questions and all the possible answers to the children. The children of the older group read the questionnaire themselves. The proctor greeted the teacher and the children first, then briefly introduced the purpose of the study. Then the following quoted message was read aloud to the children at the start of the administration.

For children nine years old or older:

This is a package of questions about your health. This is not a test. There are NO right or wrong answers. You will be asked to answer questions about food and physical activity. There are 10 parts to this questionnaire, labeled 1-10. If you don't understand the question or if you don't understand how to answer the question, please raise your hand. Someone will come to your desk to help you. Remember, there are NO right or wrong answers, and NO one at your school will see your answers.

For children younger than nine years old:

This is a package of questions about your health. This is not a test. There are NO right or wrong answers. You will be asked to answer questions about food and physical activity. There are 10 parts to this questionnaire, labeled 1-10. The direction for each section will be read aloud to you. Each question and the possible answers will also be read aloud to the class. You should read along on your copy of the question. If you don't understand the question or if you don't understand how to answer the question, please raise your hand. Someone will come to your desk to help you. Remember, there are NO right or wrong answers, and NO one at your school will see your answers.

The proctor walked around the classroom during the administration, making sure that the children understood the questions. The proctor also answered individual student's questions quietly so as not to disturb others or influences others' answers. The Chinese schoolteachers were allowed to remain in the classroom to help maintain the classroom order, but they were not allowed to walk around because the survey was confidential. To help maintain confidentiality, students were not allowed to talk to each other during the process.

Questionnaire Collection

Students were asked to leave the completed questionnaire in a specially made box to which only the researcher had access. Those children who chose not to complete the survey were asked to finish the demographic session and return the blank questionnaires into the same box. The average time to finish the questionnaires was about 40 minutes.

When all the questionnaires were collected, the box was given to the researcher and taken away immediately from the Chinese school.

Data Collection Part B

The researcher and one helper contacted the parents first, and upon their oral consent the data collection part B was conducted in children's homes or a convenient place named by the participants or the parents/guardians. The researcher or the helper explained the study to the parents and the children. After the parents/guardians signed the informed consent, the researcher distributed the survey to the children. For children younger than nine years old, the researcher read out the questions and all of the possible answers to the children. The children who were nine years old or older read the questionnaire themselves. Parents/guardians were not allowed to view the children's responses on the survey. The researcher was available all the time to answer questions through the whole process. After the children finished the survey, the researcher thanked them for their participation and took the signed informed consent and completed surveys away.

Interview with Parents

To further explore the SCT factors, the current project investigated parents' perspective on children's dietary behavior and physical activity. A semi-structured interview was used. The whole interview consisted of five general questions regarding children's dietary behaviors, physical activity, personal and environmental factors (physical environmental and social environmental factors), parents' role, and parents' concern. Interviews were conducted by the current researcher with one of her colleagues, both being bilingual (Chinese and English). A convenience sample of parents whose

children participated in the questionnaire survey part was used. The parents were contacted via the Chinese School and personal network. The inclusion criterion was that the children of the family had participated in the survey research part of the project. After the parents agreed to participate, a total of four to six families were selected by their children's ages (6-12 and 12-18 years old) and whether or not their children were in the Chinese Weekend School. The time of the interview meeting was about one hour long. The interviews took place in a setting that the parents chose. The interview process followed the interview protocol (Appendix C). These interviews were audio-taped, transcribed and translated when the interview was in Chinese. No names were used in the audiotape and transcriptions. The anonymous records are kept in a secure place to which only the researcher has access. Both the audiotapes and transcriptions will be destroyed five years after completion of the project.

Definition of Variables

Based on the Social Cognitive Theory (SCT), the major variables examined in this study were personal factors, environmental factors and behaviors. Personal factors include demographics, acculturation, self-efficacy and knowledge. Environmental factors include physical environment and social environment (perceived support and social reinforcement). Behaviors include children's dietary behavior and regular physical activity. The operational definitions of each variable of the three categories are structured using the SCT and presented as below. Table 2 shows how the instrument measures each variable.

Table 2: Summary of the Questionnaire

Constructs/RQ #	Measures	Section #	Variables	Question #
Personal Factors				
Demographics/RQ #2	Self-Developed	1	Age	D1
			Gender	D2
			Grade	D3
			Birth Order	D4
			Height	D5
			Weight	D6
Acculturation/RQ #3	Self-Developed	1	Attending Chinese school	D7
			Speak Chinese at home	D8
			Region of birth	D9
			Parents' ethnicity	D10, D11
			Prefer reading language	D12
			Prefer social language	D13
			Length of stay in USA	D14
Knowledge/RQ #4	HBQ	3	Dietary knowledge	DK1-DK13
Self-efficacy//RQ #4	HBQ	6	Dietary self-efficacy	DSE1-DSE15
		10	Physical activity self-efficacy	PSE1-PSE5
Environmental Factors				
Physical Environment/ RQ #5	Self-Developed	2	Food availability	EP1, EP2
			Exercise place availability	EP3, EP4,
			Neighborhood safety	EP5
			Family structure and size	EP6, EP7
			Family members/guardians providing after school care	EP8, EP9
			Parent's education level	EP10, EP11
			Lunch source	EP12
Social Environments/ RQ #6				
Reinforcement	HBQ	7	Perceived reinforcement for dietary behavior	DR1-DR7
Social Support	HBQ	9	Perceived social support for physical activity	PSS1-PSS18
Behaviors				
Dietary Behavior	NHNESIII	4	24-hour diet recall	Form
	YRBS	5	Eat in the past 7 days	DB1-DB12
Physical Activity	YRBS	8	Physical activity in the past 7 days	PA1-PA3, PA5-PA7
Sedentary Activity	YRBS	8	Watching TV, playing on computer, and playing video games in the past 7 days	PA4

Personal Factors

Demographics

Demographic characteristics include the following variables. Weight status was calculated by using the Body Mass Index (BMI) formula recommended by CDC.

1. Age: How old are you? (Ratio)
2. Gender: Are you a boy or a girl? (Nominal)
3. Grade: Which grade are you in the regular school? (Ordinal)
4. Birth order: Do you have a brother or sister? (Nominal)
5. Height: How tall are you without your shoes on in INCHES (1 foot=12 inches)? (Ratio)
6. Weight: How much do you weigh without your shoes on, in pounds? (Ratio)

Acculturation

The Acculturation scale includes the following variables. The questions concerned with acculturation were developed based on Wong-Kim's study (Wong-Kim et al., 2003). They ask about attending Chinese school (yes or no), primary language spoken at home, preferred language used in reading and preferred language used at social gatherings (Chinese, English and other), the parents' ethnicity (Is the mother or the father Chinese), region of birth (China, Hong Kong, Taiwan, the U.S., or other countries), and length of stay in the U.S.

The summary score of acculturation is calculated according to the method used by Wong-Kim's study (Wong-Kim et al., 2003). If either of the parents is Chinese, this item scores 0 points; if not, the item scores 1. Similarly, if the child speaks English at home, or prefers English in reading or social life, the item scores 1; otherwise, it scores 0 points.

If the child was born in Asia, the item scores 0 points; if not, the item scores 1. The summary scores of acculturation range from 0-6, with 0 indicating the least acculturated and 6 indicating the most acculturated.

Knowledge

If a person is to perform a particular behavior, he or she must know what the behavior is and how to perform it (Baranowski et al., 2002). In this current study, this knowledge is measured by 13 adapted HBQ knowledge questions to measure students' knowledge of identifying the healthier food of two food choices (Edmundson, Parcel, Feldman et al., 1996). The choice of the healthy food scores 1 point, while the unhealthy food choice was scored 0. The summary score of knowledge of healthy food choice ranges from 0 to 13, in which 0 indicates very poor knowledge of healthy food and 13 indicates very good knowledge of healthy food.

Self-efficacy

Self-efficacy refers to the confidence a person feels about performing a particular activity, including confidence in overcoming the barriers to performing that behavior (Bandura, 1997). In the current study, self-efficacy is operationally defined as how sure the children are to choose a certain food or how sure they are to engage in certain physical activity. The scale used a 3-point ordinal response set (i.e., not sure, a little sure, very sure) for each item and was scored as follows: not sure =-1, a little sure=0, and very sure = +1 (Edmundson, Parcel, Feldman et al., 1996). The dietary self-efficacy was measured by a 15-item HBQ scale, and the summary scores of dietary self-efficacy range from -15 to 15, with -15 indicating the least self-efficacy and 15 indicating the most self-efficacy. The physical activity self-efficacy was measured by the 5-item HBQ scale, and

the summary score of physical activity self-efficacy ranges from -5 to 5, in which -5 indicates the least self-efficacy and 5 indicates the most self-efficacy.

Environmental Factors

The term environment refers to the objective factors that can affect a person's behavior but that are physically external to that person (Baranowski et al., 2002). In the current study, it includes the physical environment factors and the social environment factors. Below is a list of the operational definitions of each environmental variable.

Physical environmental factors

Physical environmental factors include availability, safety, and family environment, etc.

1. Fast food availability: Is fast food such as potato chips, candy, and cookies always available in your home? (Nominal, yes/no)
2. Healthy food availability: Is fruit always available for you as a snack? (Nominal, yes/no)
3. Availability of recreation center: How close is the nearest recreation center to your home? (Nominal)
4. Availability of playground: How close is the nearest playground to your home? (Nominal)
5. Safety of neighborhood: How do you evaluate the safety of your neighborhood? (Ordinal)
6. Family structure: Who is in your family? (Nominal)
7. Family size: How many people do you live with (do NOT count yourself)? (Ratio)

8. Family members/guardians providing after school care at home: Who is there when you get home after school? (Nominal)
9. Family members/guardians providing after school care outside: Who usually takes you outside to play? (Nominal)
10. Parent's education level: What is the highest level of school your mother/father went to? (Nominal)
11. Lunch source: How do you get your lunch on school days? (Nominal)

Social environment factors

The social environmental factors in the current study refer to the perceived social reinforcement and social support.

Social reinforcement, a response to a person's behavior that increases the likelihood that the behavior will be repeated (Baranowski et al., 2002), is measured by a 21-item HBQ scale concerning the perceived social reinforcement from family, teachers, and friends for healthy foods (Edmundson, Parcel, Feldman et al., 1996). For each item, a "yes" response was coded as +1, while the "no" was scored -1. The items were totaled for one sum, and subscales were also created for the source: parents, teachers, and friends. The dietary social reinforcement score is dichotomous, but separated by the support source. The subtotal ranges from -7 to 7, in which -7 indicates the least social reinforcement and 7 indicates the most social reinforcement.

Perceived support, including positive support and negative support, is measured by an 18-item HBQ scale concerning the perceived support from family, teachers, and friends for physical activity (Edmundson, Parcel, Feldman et al., 1996). Each item was scored dichotomously. The healthier or more supportive response option was scored +1,

and the alternative option was scored -1. The total score ranges from -18 to 18, in which -18 indicates the least perceived support, while 18 indicates the most perceived support.

Behaviors

Behaviors measured in the current study include children's dietary behavior and physical activity and sedentary behaviors.

Dietary Behavior

Dietary Behavior refers to the food and beverages the children consume the day before the survey, which is measured by the 24-hour diet recall form (Smiciklas-Wright & Guthrie, 1995), and generally food intake in the past 7 days, which is measured by an adapted 12-item YRBS 2003 dietary behavior questionnaire (Centers for Disease Control and Prevention, 2003). According to the YRBS report, vegetables, fruit and fruit juice were categorized together: less than one time per day scores 0, one time per day scores 1, two times per day scores 2, three times per day scores 3, and four times per day scores 4. The sum scores of eating vegetables, fruit and fruit juice range from 0-24, in which 0 indicates that no vegetable, fruit and fruit juice intake occurred during the past seven days and 24 indicates twenty four times or more vegetable, fruit and fruit juice intake occurred per day during the past seven days. The 24-hour diet recall items were categorized into five food groups according to the food pyramid: grains (bread, cereal, rice, pasta), vegetables, fruit (fresh fruit, chopped fruit, canned fruit, fruit juice), milk (milk, yogurt, and cheese), and meat (meat, poultry, fish, dry beans, eggs m and nuts). Other food such as sugar products, chips, soda, prepared food, and rice were also categorized.

Physical Activity

This refers to the participation in vigorous and moderate physical activity, physical education classes, sports teams and engagement in sedentary activity such as watching TV, and is measured by an adapted 7-item YRBS 2003 physical activity behavior questionnaire (Centers for Disease Control and Prevention, 2003).

Data Analysis

Data were entered by the researcher and analyzed using the Statistical Package for Social Science (SPSS version 11.0; SPSS Inc, Chicago, Ill). The descriptive statistics, including frequencies, sum scores attained on the individual constructs, and mean scores on various individual items were examined first. Frequency tables were generated for each category in the demographic and physical environment section. The Likert-type scales were summed and treated as interval/ratio level. Cronbach's α was used to examine the internal consistency of constructs that used scales as the measurement.

Bivariate relationships between the independent variables and dependent variables were explored. The Mann-Whitney U test, Chi-square test and Spearman's rank order correlation were used to test for relationships between the data based on the distribution and the measurement level of data. Logistical regression analysis was employed to test the relationship between behavior, personal factors, and environmental factors of SCT model. The independent variables that had significant relationships with dependent variables at $p \leq .25$ at the bivariate level were included in the multivariate model. The alpha level of statistical significance for all the bivariate hypotheses of this study was set at .05 due to the small sample size. The alpha level of .10 was considered as the approaching significance level for bivariate, but as significant for logistic regression

analysis. Refer to the statistical analysis matrix (Table 3-Table 8) for the tests used for each hypothesis.

The results of the interview were analyzed. Individual responses to each interview question were examined, compared, and coded. The coding process itself was a "cut and paste" iterative process whereby conceptually similar responses were grouped into categories. Thus, responses from different parents to each question were grouped together under categories that emerged from the distribution of the responses themselves after thorough review of the data.

Assumptions

It is assumed that the responses of participating children are accurate and truthful and that responses referring to dietary behaviors and physical activities they perform in a given situation are indicative of actual behaviors. It also assumes all the Chinese children share similar genetic characteristics and that the Chinese Weekend School has a cultural influence on the children. It also assumes that parents who send their children to Chinese Weekend School are more likely to maintain Chinese cultural identities.

Limitations

This was an observational, cross-sectional study design using the snowball sampling method. Snowball sampling makes the results not generalizable to all Chinese children in these three cities. The relatively small sample size may limit the external validity of the study. Participation was voluntary. Those who participated might have been more concerned and responsive about the issue than those who did not participate. Another limitation is that children who were recruited through the American-Chinese Association may be willing to be bound to Chinese culture even if they don't attend

Chinese school. This may make it more difficult to examine their extent of acculturation. Self-report survey was used for the source of the information, and social-bias was the potential threat.

Table 3: Statistical Matrix for Research Question 1: Does the SCT model predict Chinese children's dietary behavior and physical activity?

Hypothesis #	DV	IV(s)	Test
a	Dietary Behavior	Personal Factors (age, gender, acculturation, knowledge self-efficacy) Environmental Factors (availability, family structure, family member's/guardian's providing after school care, social reinforcement, and perceived support)	Logistic regression
b	Physical Activity	Personal factors (age, gender, acculturation, and self-efficacy) Environmental Factors (availability, family structure, family member's/guardian's providing after school care, social reinforcement, and perceived support)	Logistic regression

Table 4: Statistical Matrix for Research Question 2: How are demographic variables associated with Chinese children's dietary behavior and physical activity?

Hypothesis #	DV	IV(s)	Test
a-i	Dietary Behavior	Age	Mann-Whitney U
a-ii		Gender	Chi Square
b-i	Physical Activity	Age	Mann-Whitney U
b-ii		Gender	Chi Square

Table 5: Statistical Matrix for Research Question 3: How is acculturation associated with Chinese children's dietary behavior and physical activity?

Hypothesis #	DV	IV(s)	Test
a	Dietary Behavior	Acculturation	Mann-Whitney U
		Length of Stay in USA	Chi Square
b	Physical Activity	Acculturation	Mann-Whitney U
		Length of Stay in USA	Chi Square

Table 6: Statistical Matrix for Research Question 4: How are knowledge and self-efficacy associated with Chinese children's dietary behavior and physical activity?

Hypothesis #	DV	IV(s)	Test
a-i	Dietary Behavior	Knowledge	Mann-Whitney U
a-ii		Self-efficacy	Mann-Whitney U
b-i	Physical Activity	Self-efficacy	Mann-Whitney U

Table 7: Statistical Matrix for Research Question 5: How are physical environmental factors associated with Chinese children's dietary behavior and physical activity?

Hypothesis #	DV	IV(s)	Test
a-i	Dietary Behavior	Availability of Healthy Food	Fisher's Exact Test
a-ii		Availability of Fast Food	Chi-Square
b-i	Physical Activity	Availability of Playground	Chi-Square
b-ii		Availability of Recreation	Chi-Square
c-i	Physical Activity	Neighborhood Safety	Chi-Square
d-i	Dietary Behavior	Family Size	Mann-Whitney U
d-ii	Physical Activity	Family Size	Mann-Whitney U
d-iii	Dietary Behavior	Family Structure	Chi-Square
d-iv	Physical Activity	Family Structure	Fisher's Exact Test
e-i	Dietary Behavior	Parent's Education Level	Chi-Square
e-ii	Physical Activity	Parent's Education Level	Chi-Square
f-i	Dietary Behavior	Family Members/Guardians Providing after School Care	Chi-Square
f-ii	Physical Activity	Family Members/Guardians Providing after School Care	Chi-Square

Table 8: Statistical Matrix for Research Question 6: How are social environmental factors associated with Chinese children's dietary behavior and physical activity?

Hypothesis #	DV	IV(s)	Test
a-i	Dietary Behavior	Perceived Parents' Social Reinforcement	Mann-Whitney U
a-ii		Perceived Teachers' Social Reinforcement	Mann-Whitney U
a-iii		Perceived Friends' Social Reinforcement	Mann-Whitney U
b-i	Physical Activity	Perceived Support	Mann-Whitney U

Table 9: Statistical Matrix for Research Question 7: How are personal factors related to environmental factors?

Hypothesis #	DV	IV(s)	Test
a-i	Dietary Knowledge	Perceived Social Reinforcement	Spearman Rho
a-ii	Dietary Self-efficacy	Perceived Social Reinforcement	Spearman Rho
a-iii	Physical Activity Self-efficacy	Perceived Support	Spearman Rho
b-i	Dietary Knowledge	Parent's Education Level	Kruskal-Wallis
b-ii	Dietary Self-efficacy	Parent's Education Level	Kruskal-Wallis
b-iii	Physical Activity Self-efficacy	Parent's Education Level	Kruskal-Wallis

CHAPTER IV

FINDINGS

In this chapter, findings of the data analyses are presented. A description of the three SCT constructs starts with behaviors, followed by the personal factors and the environmental factors. Detailed bivariate relationships between the three factors then are examined. Based on the results of bivariate analysis, predictors of dietary behaviors and physical activity are explored by logistic regression model. The interviews with parents are presented before a brief summary of findings.

Description of Results of Three SCT Constructs

Behaviors

Behaviors were measured by the dietary behavior and physical activity questions adapted from Youth Risk Behaviors Survey (YRBS). The results are presented using the YRBS report format.

Dietary Behaviors

Dietary behaviors were measured by modified YRBS questions (Centers for Disease Control and Prevention, 2003) and a 24-hour diet recall form (Smiciklas-Wright & Guthrie, 1995).

Consumption of Fruits and Vegetables: The mean score of the vegetable and fruit intake is 3.9 (SD=4.0) with an actual range from 0 to 20 with 38.6% of the children having eaten more than five servings per day of fruits and vegetables during the seven days preceding the survey.

Consumption of Milk: Overall, twenty percent of the children drank more than three glasses per day of milk during the seven days preceding the survey. Fifty-five

percent of the children drank at least one glass per day of milk during the seven days preceding the survey.

Consumption of traditional Chinese food: Seventy-four percent of the children had eaten more than one serving of rice per day during the 7 days preceding the survey while 45.8 % of the children had eaten at least one serving of tofu during the seven days preceding the survey.

Consumption of fast-food: Overall, only 6.3% of the children had not eaten any fast-food such as French fries, fried potatoes, potato chips, ice cream or milkshakes, candy or cookies, nor drank soda during the seven days preceding the survey. Fourteen percent of the children had eaten one of the four types of fast-food (French fries, fried potatoes, potato chips; ice cream or milkshakes; candy or cookies; or soda) during the seven days preceding the survey. About one third (31.3 %) had all four kinds of fast-food during the 7 days preceding the survey. The results of the YRBS questions are presented in Table 10.

24 hour diet recall: Grain (86.7%) and meat (76.0%) were the most often eaten items, while more than half of the children had not eaten any vegetables (61.3%) or fruits (62.7%) in the 24 hours preceding the survey. Most children did not appear to select sugar products (78.7%), chips (86.7%), or soda (86.7%) in the 24 hours preceding the survey. The details are presented in Table 11.

Table 10: Dietary Behaviors

Dietary Behaviors	N	Intake during the past 7 days preceding the survey (%)					
		0	<1/day	1/day	2/day	3/day	4/day
Fruit and Vegetable							
Fruit	83	8.4	48.2	14.5	15.7	4.8	8.4
Other vegetables	83	8.4	33.8	26.5	9.6	12.0	9.6
Fruit Juice	83	24.1	38.3	12.0	7.2	8.4	10.8
Potato	83	49.4	37.3	8.4	2.4	0	2.4
Carrot	83	50.6	34.9	1.2	4.8	2.4	6.0
Green Salad	83	61.4	28.9	7.2	1.2	0	1.2
Milk	83	9.6	35	25.3	16.9	2.4	10.8
Chinese Food							
Rice	82	9.8	25.6	35.4	11.0	4.9	13.4
Tofu	83	54.2	37.3	1.2	1.2	3.6	2.4
Fast-food							
Candy/Cookie	80	17.5	47.5	17.5	12.5	3.8	1.3
Potato Chips Etc.	83	32.5	45.8	13.3	2.4	1.2	4.8
Soda	80	41.3	37.6	8.8	5.0	2.5	5.0
Ice Cream	80	51.3	36.3	5.0	3.8	0	3.8

Table 11: 24-Hour Diet Recall (N=75)

Food Group	0 servings n (%)	1 servings n (%)	2 servings n (%)	3 servings + n (%)
Meat	18 (24.0%)	28 (37.3%)	19 (25.3%)	10 (13.3%)
Milk	37 (49.3%)	24 (32.0%)	11 (14.7%)	3 (4.0%)
Fruit	47 (62.7%)	21 (28.0%)	6 (8.0%)	1 (1.3%)
Vegetable	46 (61.3%)	18 (24.0%)	8 (10.7%)	3 (4.0%)
Grain	10 (13.3%)	18 (24.0%)	20 (26.7%)	27 (36.0%)
Sugar products	59 (78.7%)	11 (14.7%)	4 (5.3%)	1 (1.3%)
Chips	65 (86.7%)	10 (13.3%)		
Soda	65 (86.7%)	7 (9.3%)	3 (4.0%)	
Prepared Food	68 (90.7%)	6 (8.0%)	1 (1.3%)	
Rice	43 (57.3%)	28 (37.3%)	5 (5.3%)	

Physical Activity

Vigorous and Moderate Physical Activity: Almost three-fourths (73.8 %) of the children had participated in activities that made them sweat and breathe hard for more than 20 minutes on three or more of the seven days preceding the survey (i.e., sufficient vigorous physical activity). A little more than one-fourth (28.8%) of the children had participated in activities that did not make them sweat or breathe hard for more than 30 minutes on five or more of the seven days preceding the survey (i.e., sufficient moderate physical activity). Twenty-nine percent of the children had not participated in vigorous physical activity for more than 20 minutes on three or more of the seven days preceding the survey, nor had they participated in moderate physical activity for more than 30 minutes on five or more of the seven days preceding the survey (i.e., insufficient amount of physical activity). Few (6.3%) of the children had not participated in either vigorous physical activity for more than 20 minutes or moderate physical activity for more than 30 minutes on any of the seven days preceding the survey (i.e., no vigorous or moderate physical activity).

Other Exercise Activities: (1) Participation in Physical Education (PE) Class: Approximately half (52.4%) of the children attended PE class daily. Fifty-five percent of the children exercised more than 30 minutes during an average PE class. (2) Participation on Sports Team: a little over half (51.6%) of the children had played on one or more sports teams during the 12 months preceding the survey. (3*) Strengthening Exercises:* Fifty-nine percent of students had done strengthening exercises (e.g. push-ups, sit-ups, and weightlifting) on three or more of the seven days preceding the survey.

Sedentary Activity: Twenty-three percent of students had watched television, played on computer or played video games three hours or more per day during an average school day. The results are presented in YRBS report format and shown in Table 12.

Dichotomous Behaviors Employed to Examine the Hypotheses

Children's dietary behaviors examined in the current study were the vegetable/fruit consumption and fast-food consumption scores generated from the YRBS questions. The vegetable/fruit consumption scores were dichotomized as five or more servings per day (61.4%) versus less than five servings per day (38.6%). The fast-food consumption scores were dichotomized as no fast-food or only once a week (37.5%) versus more than once a week (62.5%). The physical activity analyzed in the current study included vigorous activity and overall activity. Vigorous activity was dichotomized into sufficient and insufficient according to YRBS cut points. Around three-fourths of the children had sufficient vigorous physical activity (73.8%) and sufficient overall physical activity (76.2%). The details of the dichotomous behavior variables are shown in Table 13.

Table 12: Physical Activity and Sedentary Activity

Activity	N	Frequency N (%)		
		0 days	1-2 days	>= 3days
Physical Activity				
Vigorous Activity	80	9 (11.3%)	12 (15.0%)	59 (73.8%)
Moderate Activity	80	17 (21.3%)	26 (32.5%)	37 (46.3%)
Strengthen Activity	80	15 (18.8%)	18 (22.5%)	47 (58.8%)
Physical Education Class on schooldays	82	15 (18.3%)	8 (9.8%)	59 (71.9%)
		1-30 minutes	31-60 minutes	61 minutes +
Actual exercising time in PE class	67	30 (44.8%)	29 (43.3%)	8 (11.9%)
		0 team	1 team	>=2 teams
Sports Team played during the past 12 months	81	10 (49.4%)	21 (25.9%)	20 (24.7%)
		0 hour	< 2 hours/day	> =2 hours/day
Watching TV or playing video/computer games	82	14 (17.1%)	34 (41.5%)	34 (41.5%)

Table 13: Dichotomized Behavior Variables Employed to Examine the Hypotheses

Behaviors	N	%
Vegetable/Fruit Consumption	83	
Less than 5 servings per day	51	61.4
5 servings or more per day	32	38.6
Fast-food intake	80	
No fast-food or once a week	30	37.5
Eating fast-food more than once a week	50	62.5
Vigorous Activity	80	
Insufficient Vigorous Activity (less than 3 times a week)	21	26.2
Sufficient Vigorous Activity (3 times or more a week)	59	73.8
Overall Activity	80	
Insufficient Activity (No or insufficient activity)	19	23.8
Sufficient Activity (Sufficient vigorous/moderate activity)	61	76.2

Personal factors

Personal factors measured in this study include demographics (6 items), acculturation (8 items), dietary knowledge (13 items adapted from Health Behaviors Questionnaire, HBQ), self-efficacy of dietary behaviors (15 items adapted from HBQ), and self-efficacy of physical activity (5 items adapted from HBQ).

Demographics

Eighty-four Chinese-American children completed the survey; 54 of them were from the Tidewater Chinese Weekend School and 30 children were not attending the Chinese weekend school. There are estimated to be 409 Chinese-American children in the region studied (U.S. Census Bureau, 2003), so the representative rate of the population in this area is 20 % (84/409).

The children's ages ranged from six to 18 years old, with a mean age of 10.5 (SD=3.7), and 70.2% of them were 12 years old or younger. The children in the Chinese School were statistically significantly older than the children not in the Chinese school ($t=-2.872$, $p<.01$). Overall, 42.9% were female and 57.1% were male. Among the Chinese school group, 26 (48.1%) were girls, and 10 (33.3 %) were girls in the non-Chinese school group. Eighty-three percent of all the children had at least one sibling in the family. The children were all enrolled in the public schools from kindergarten to grade 12.

Body Mass Index (BMI) of the Children

Among the 63 children who reported weight and height, the average height of the children was 57.0 inches (SD=8.8) with a mean weight of 90.3 pounds (SD=34.7). The results were grouped by age and sex, and then compared to the CDC growth chart.

Almost one third (31.7%) of the children were at risk of overweight (i.e., BMI is greater than 85 percentile on the CDC growth chart), and 17.5% of the children were overweight (i.e., BMI is greater than 95 percentile on the CDC growth chart). Fisher's Exact test showed that children 6-12 years old had a higher rate of being at risk of overweight and being overweight than children 13-18 years old ($p<.05$). No significant difference was found between girls and boys, nor between the children who attended the Chinese Weekend School and those who did not. The details are presented in Table 14.

Table 14: Demographics and Body Mass Index

Demographics	N	%
Age (Mean =10.5 year SD=3.7)	84	
6-12 years old	59	70.2
13-18 years old	25	29.8
Gender	84	
Boy	48	57.1
Girl	36	42.9
Grade in regular school	79	
Elementary school (Grade 1-6)	49	62.0
Middle school (Grade 7-9)	17	21.5
High School (Grade 10-12)	13	16.5
Birth order	84	
No brother or sister	14	16.7
The oldest child	30	35.7
Middle child	8	9.5
Youngest child	32	38.1
Attending Chinese School	84	
Yes	54	64.3
No	30	35.7
Height in Inches (Mean=56.96, SD=8.81)	69	
Weight in Pounds (Mean=90.28, SD=34.71)	72	
BMI	63	
>85 percentile (at risk of overweight)	20	31.7
6-12 years old	17	41.5
13-18 years old	3	13.6
>95 percentile (overweight)	11	17.5
6-12 years old	10	24.4
13-18 years old	1	4.5

Acculturation

The summary scores of acculturation range from 0-6, with 0 indicating the least acculturated and 6 indicating the most acculturated. The mean acculturation score is 3.2 (SD=1.4). Fifty-four of the children attended Chinese Weekend School and 30 of the children did not attend the Chinese school. One-third of the children speak Chinese at home. For most of the children, English is the preferred language for them to use while reading (89.3%) and socializing (79.5%). Sixty-three percent of the children were born in the USA, and16.7 % of them have at least one parent who is not Chinese. The mean length of stay in the USA is 7.2 years (SD=4.1). The ratio of length of stay in the U.S. and age was calculated. Around one fifth (21.6%) of the children spent less than half of their life in the U.S, while more than half (55.7%) of the children have lived in the U.S. since they were born. The details are presented in Table 15.

Dietary Knowledge

The summary scores of knowledge range from 0 to 13 with a mean of 8.18 (SD=3.29). Seventy percent had seven correct answers out of the 13 items, i.e., more than 50 % of the answers were correct on the 13-item knowledge section. A score of 7 was regarded as the passing score for this study. Item analysis, i.e., how children responded to each item is summarized in Table 16. The top three items having the most correct answers are: peanut butter versus bologna (73.3%), broiled beef versus broiled fish (71.7%), and French fries versus baked potato (71.7%). The top three items having the most incorrect answers are: frozen corn versus canned corn (43.2% correct), beef versus beans (52.6% correct), and cold cereal versus egg and bacon (53.3% correct).

Table 15: Acculturation

Acculturation	N=84	%
Sum score*: Mean=3.16, SD=1.38, range 0 to 6		
Language spoken most of the time at home	83	
Chinese	35	42.2
English	48	57.8
Place of Birth	83	
China or vicinity area	31	36.9
The United States of America	53	63.1
Mother is Chinese	77	91.7
Father is Chinese	72	85.7
Language preferred for reading:	84	
Chinese	9	10.7
English	75	89.3
Language preferred for social life:	83	
Chinese	17	20.5
English	66	79.5
Length of stay in U.S. (Mean=7.15 year, SD=4.14)	79	
Less than 50% of life	17	21.6
50% to 99% of life	18	22.8
100% of life	44	55.7

* Calculated by adding the six items regarding language, nationality, and place of birth together, in which higher scores indicated more acculturated.

Table 16: Dietary Knowledge

Dietary Knowledge: Which food is better for your health?	N	Correct n	Correct %
Sum Score*: Mean=8.18, SD=3.29, Range: 0 to13, 70 % having the passing score.			
Frozen corn versus canned corn	79	32	43.2
Beef versus beans	81	40	52.6
Regular milk versus low fat or skin milk	80	40	53.3
Cold Cereal versus egg and Bacon	81	43	56.6
Regular peanut butter versus freshly ground peanut butter	80	43	57.3
Frozen yogurt versus ice cream	81	46	60.5
Whole wheat bread versus white bread	82	51	66.2
Chicken versus hamburger	80	55	67.1
Raisins versus candy	81	53	69.7
French fries versus baked potato	80	53	70.7
Broiled beef versus broiled fish	81	54	71.1
Green salad versus French fries	81	54	71.1
Peanut butter versus bologna	80	55	73.3

*Calculated by adding all 13 items together, in which higher scores indicate greater knowledge of healthy eating. A score of 7 (having seven correct answers out of the 13 items, i.e., more than 50 % of the answers were correct) was considered a passing score.

Self-efficacy

The summary scores of dietary self-efficacy of the current study ranged from -15 to 15 with a mean of 2.8 (SD=7.4). Note that a positive sum score (≥ 1) indicates having positive dietary self-efficacy for this study. Sixty-two percent of the children had positive dietary self-efficacy. Item analysis, i.e., how children responded to each item, is summarized in Table 17. The three items that the children were least sure that they could do are: no spread on bread (29.8% very sure), eat salad at a fast-food restaurant (31.2% very sure), and eat popcorn without salt (33.3% very sure). The three things about which the children were most sure are their ability to: eat cereal (67.9% very sure), eat cooked vegetables without butter (67.5% very sure), and drink fruit juice (59.7% very sure).

The summary scores of physical activity self-efficacy range from -5 to 5 with a mean of 1.5 (SD=2.9). A score of 1 or higher was regarded as having positive physical activity self-efficacy for this study. Sixty-three percent of the children had positive physical activity self-efficacy. Item analysis, i.e., how children responded to each item, is summarized in Table 18. The one thing about which the children were most sure is being able to exercise and keep moving most of the time in PE class (63.3% very sure), while the one thing about which the children were least sure is being able to keep up a steady pace without stopping for 15-20 minutes when being physically active (38.8% very sure).

Table 17: Dietary Self-Efficacy

Dietary Self-efficacy: how sure are you about your food choice?	Total N	Not Sure N	Not Sure %	A little Sure N	A little Sure %	Very sure N	Very sure %
Sum Score*: Mean=2.8, SD=7.4, range: -15 to 15, 61.9% having positive self-efficacy							
No spread on bread	83	30	36.1	20	24.1	33	29.8
Eat salad at a fast-food restaurant	82	33	42.9	20	26	24	31.2
Popcorn without salt	83	40	51.3	12	15.4	26	33.3
Frozen yogurt	81	27	35.5	20	36.3	29	38.2
Fresh fruit	83	29	37.2	18	23.1	31	39.7
Baked potato	82	27	35.1	19	24.7	31	40.3
Eat food without adding salt	83	26	33.3	19	24.4	33	42.3
Eat lettuce and tomato	83	30	38.5	14	17.9	34	43.6
Bread sticks	82	28	36.4	15	19.5	34	44.2
Eat fresh or frozen vegetables	83	20	25.6	21	26.9	37	47.4
Take skin off chicken	82	28	36.4	12	15.6	37	48.1
Low fat whit milk	83	24	30.8	10	12.8	44	56.4
Fruit juice	82	18	23.4	13	16.9	46	59.7
Cooked vegetables without butter	82	21	27.3	4	5.2	52	67.5
Cereal	83	10	12.8	15	19.2	53	67.9

*Calculated by adding all 15 items together, in which higher scores indicate higher dietary self-efficacy. A score of 1 or higher was considered as having positive self-efficacy.

Table 18: Physical Activity Self-Efficacy

Physical Activity Self-efficacy: how sure you are about your physical activity?	Total N	Not Sure N	Not Sure %	A little Sure N	A little Sure %	Very sure N	Very sure %
Sum Score*: Mean=1.51, SD=2.86, Range: -5 to 5, 63.4 % having positive self-efficacy							
Keep up a steady pace without stopping for 15-20 minutes when be physically active	80	19	23.8	22	27.5	39	38.8
Choose jogging during recess	80	24	30.0	17	21.3	39	48.8
Improve physical fitness by running or biking 3-5 times a week	80	17	21.3	21	26.3	42	52.5
Be physically active 3-5 times a week	80	16	20.0	18	22.5	46	57.5
Exercise and keep moving most of the time in PE class	79	13	16.5	16	20.3	50	63.3

*Calculated by adding all 5 items together, in which higher scores indicate higher physical activity self-efficacy. A score of 1 or higher was considered as having positive self-efficacy.

Environmental Factors

Physical environmental factors

Physical environmental factors are presented as follows. (1) Food availability: Generally, fast-food is available in 48.8 % of the families, while fruit is available in 88.1% of the families. (2) Exercise place availability: Thirty-six percent of the children live in a neighborhood that has a recreation center nearby which they can either walk or ride a bike there, and 66% have a playground nearby. (3) Safety: Sixty-five percent of the children rate their neighborhood a very safe place. (4) Family structure: About three-fourths (73.4 %) of the children live in a household that has at least three persons, and 22.6% of them have grandparents in the household. (5) After school care: After school, the mother is the main caregiver at home (50.0 %), and a few children do not go outside to play (17.9%) or play outside alone (28.6%). (6) Parents' education: Almost four-fifths (78.5%) of the fathers hold a college or above degree and 67.1 % of mothers have the same educational level. (7) Lunch Source: Half of the children (50.6%) buy lunch at the school cafeteria. The details are presented in Table 19 and Table 20.

Table 19: Physical Environment

Physical environmental factors	N	%
Food availability	84	
Fast-food	41	48.8
Fruit	74	88.1
Exercise place availability		
Nearest Recreation Center	83	
Walk there	15	18.1
Ride a bike there	15	18.1
Parents drive	37	44.6
Never go	16	19.3
Nearest playground	82	
Walk there	33	40.2
Ride a bike there	20	24.4
Parents drive	17	20.7
Never go	12	14.6
Neighborhood safety	82	
A little bit/somehow unsafe	8	9.8
Somehow safe	21	25.6
Very safe	53	64.6
Family structure	84	
Mother	80	95.2
Father	77	91.7
Sister	29	34.5
Brother	35	41.7
Grandparents	19	22.6
Other	6	7.1
Family size (# of people live with) (Mean=3.57, SD=1.8)	79	
After school care at home	84	
Mother	42	50.0
Father	13	15.5
Brother	13	15.5
Sister	15	17.9
Grandparents	19	22.6
Other	9	10.7
Mother's education level	79	
Less than high school	13	16.5
High school	13	16.5
College or above	53	67.1
Father's education level	79	
Less than high school	9	11.4
High school	8	10.1
College or above	62	78.5

Table 20: Physical Environment (continued)

Physical environmental factors	N	%
Who takes children to play outside	84	
Don't go outside to play	15	17.9
Nobody, play outside by self	24	28.6
Mother	16	19.0
Father	8	9.5
Grandparent or other	21	25.0
Lunch source	83	
Fix lunch by self	9	10.8
Parent fixes lunch	16	19.3
Buy lunch at school	42	50.6
Eat lunch at school for free	16	19.3

Social environmental factors

Social reinforcement: The mean sum scores of the social reinforcement from parents, teachers, and friends are 2.95 (SD=3.90), -4.20 (SD=4.18), and –5.08 (SD=2.98) respectively. Parents are the major source of social reinforcement. All (100%) of the children perceived social reinforcement from parents on at least two items, with 75% perceived social reinforcement of healthy dietary behavior from parents on four or more items. More than half (55%) of the children perceived no social reinforcement from a teacher on all the seven items, and 56% of the children perceived no social reinforcement from friends across all the items. The details are presented in Table 21. The two items of perceived most reinforcement from parents are: eating lots of fruits and vegetables (95.0%), and eating a salad instead of eating a hamburger (72.5%). The two items of perceived least reinforcement from parents are: eating bread with no spread instead of margarine/butter (62.5%), and eating chicken meat without the skin (62.5%)

Perceived support: The sum scores range from -16 to 16 with a mean of 7.2 (SD=5.9). Eighty-five percent of the children had perceived support of their activity on more than nine items. The details are presented in Table 22. The three items of perceived most positive support are: my friends and I have fun when we are physically active playing together (89.0%); most of my friends are physically active (82.7%); and most of my friends want me to be physically active when we play (74.4%). The three items of perceived most negative support are: when doing sports, most of my classmates choose me last for their team (33.3%); one or both of my parents want me to stay inside when I want to be physically active outside (30.5%); and one or both of my parents will not let me do physical activities when I want to (26.8%).

Table 21: Social Reinforcement

Social Reinforcement: What do other people want you to eat?	N	%
Sum Score of Parent's Reinforcement*: 2.95 (SD=3.90)		
Sum Score of Teacher's Reinforcement*: -4.20 (SD=4.18)		
Sum Score of Friend's Reinforcement*: -5.08 (SD=2.98)		
Eat popcorn without salt and butter on it	80	
Parents	52	65.0
Teachers	11	13.8
Friends	16	20.0
Eat lots of fruits and vegetables	80	
Parents	76	95.0
Teachers	24	30.0
Friends	14	17.5
Eat food without putting salt on it from the salt shaker	80	
Parents	57	71.3
Teachers	14	17.5
Friends	8	10.0
Drink skim or low fat milk instead of whole milk	80	
Parents	55	68.8
Teachers	22	27.5
Friends	12	15.0
Eat bread with no spread instead of margarine/butter	80	
Parents	50	62.5
Teachers	9	11.3
Friends	10	12.5
Eat the chicken meat without the skin	80	
Parents	50	62.5
Teachers	13	16.3
Friends	11	13.8
Eat a salad from the salad bar instead of eating a hamburger	80	
Parents	58	72.5
Teachers	19	23.8
Friends	6	7.5

*For each item, a "yes" response was coded as +1, while the "nos" were scored -1. The items were totaled for one sum, and also created subscales for the source: parents, teachers, and friends. The subtotals range from -7 to 7, with -7 indicating the least social reinforcement, while 7 indicates the most social reinforcement. A minus score indicates negative reinforcement, while a positive score indicates positive reinforcement.

Table 22: Perceived Support

Perceived Support	N	n	%
Sum Score*: 7.2 (SD=5.9), Range -16 to 16			
Positive support			
One or both of my parents do exercises with me	82	38	46.3
One or both of my parents are physically active.	81	41	50.6
Most of my teachers are physically active.	76	41	53.9
One or both of my parents like to watch me when I am being physically active.	82	45	54.9
When I am physically active, one or both of my parents smile and cheer for me.	82	45	54.9
When doing sports most of my classmates want me on their team.	79	47	59.5
When I am physically active in PE class, my PE teacher tells me I am doing a good job.	78	57	73.1
When I am physically active, most of my friends tell me I am a good player.	80	59	73.8
Most of my friends want me to be physically active when we play.	82	61	74.4
Most of my friends are physically active.	81	67	82.7
My friends and I have fun when we are physically active playing together.	82	73	89.0
Negative Support			
Most of my friends tease me a lot when I am physically active.	80	9	11.3
Most of my classroom teachers criticize people who exercise.	77	11	14.3
When I am physically active at recess, most of my classroom teachers tell me to stop.	79	12	15.2
When I am physically active, most of my friends make fun of me.	80	14	17.5
One or both my parents will not let me do physical activities when I want to.	82	22	26.8
One or both of my parents want me to stay inside when I want to be physically active outside.	82	25	30.5
When doing sports, most of my classmates choose me last for their team.	78	26	33.3

*The healthier or more supportive response option was scored +1. The alternative option was scored -1. The actual total scores range from –16 to +16, while +16 indicates the most positive support and –16 indicates the more negative support (i.e. the least positive support).

Bivariate Relationships

Demographics and Health Behaviors

Research Question 2: How are demographic variables associated with Chinese children's dietary behaviors and physical activity?

Hypothesis 2-a-i: Older children will be more likely to have unhealthy dietary behaviors than younger children.

This hypothesis is rejected. There was no relationship between age and children's dietary behaviors, i.e., vegetable/fruit intake and fast-food intake. No significant relationship was found between age group and children's dietary behaviors (Table 23).

Hypothesis 2-a-ii: Boys will be more likely to have unhealthy dietary behaviors than girls.

This hypothesis is rejected. There was no relationship between sex and children's dietary behaviors, i.e., vegetable/fruit intake and fast-food intake (Table 23).

Hypothesis 2-b-i: Younger children will be more likely to be physically active than older children.

This hypothesis is rejected. There was no relationship between age and children's physical activity, i.e., vigorous activity and overall activity. No significant relationship was found between age group and children's dietary behaviors, either (Table 24).

Hypothesis 2-b-ii: Boys will be more likely to be physically active than girls. This hypothesis is rejected. Chi-square showed that there were no significant correlations between the gender and vigorous or overall activity (Table 24). However, boys were more likely to be vigorously active than girls at an approaching significant level ($p<.10$).

Table 23: Demographics and Dietary Behavior

Demographics	Dietary Behavior			
	Vegetable/Fruit		Fast-food	
	< 5 servings/day (N=51)	≥ 5 servings/day (N=32)	No fast-food (N=30)	Having fast-food (N=50)
Age	10.67 (SD=3.77)	10.34 (SD=3.65)	10.47 (SD=3.55)	10.86 (SD=3.76)
6-12yrs	34 (58.6%)	24 (41.4%)	21 (38.2%)	34 (61.8%)
13-18yrs	17 (68.0%)	8 (32.0%)	9 (36.0%)	16 (64.0%)
Gender				
Boys	29 (60.4%)	19 (39.6%)	16 (34.0%)	31 (66.0%)
Girls	22 (62.9%)	13 (37.1%)	14 (42.4%)	19 (57.6%)

Table 24: Demographics and Physical Activity

Demographics	Physical Activity			
	Vigorous Activity		Overall Activity	
	Insufficient (N=21)	Sufficient (N=59)	Insufficient (N=19)	Sufficient (N=61)
Age 10.5 (SD=3.7)	10.71 (SD=4.33)	10.36 (SD=3.36)	10.68 (SD=4.24)	10.38 (SD=3.43)
6-12yrs	13 (22.8%)	44 (77.2%)	12 (21.1%)	45 (78.9%)
13-18yrs	8 (34.8%)	15 (65.2%)	7 (30.4%)	16 (69.6%)
Gender				
Boys	9 (19.1%)	38 (80.9%)*	9 (19.1%)	38 (80.9%)
Girls	12 (36.4%)	21 (63.6%)	10 (30.3%)	23(69.7%)

* $p<.10$

Acculturation and Health Behaviors

Research Question 3: How is acculturation associated with Chinese children's dietary behavior and physical activity?

Hypothesis 3-a: Children who are less acculturated will be more likely to have healthy dietary behavior than children who are more acculturated.

This hypothesis is partly accepted. Results showed that there were no relationships between the acculturation score and dietary behaviors (Table 25). However, contrary to the hypothesis, children who had lived in the U.S. since they were born were less likely to eat fast-food than children who had not spent their entire lives in the U.S. ($p<.05$).

Hypothesis 3-b: Children who are less acculturated will be more likely to be physically active than children who are more acculturated.

This hypothesis is not accepted. Results showed that there were no relationships between the acculturation score and physical activity (Table 26).

Table 25: Acculturation and Dietary Behavior

Acculturation	Dietary Behavior			
	Vegetable/Fruit		Fast-food	
	< 5 servings/day (N=46)	≥ 5 servings/day (N=32)	No fast-food (N=27)	Having fast-food (N=49)
Acculturation 3.16 (SD=1.4)	3.16 (SD=1.31)	3.09 (SD=1.49)	3.44 (SD=1.06)	3.00 (SD=1.47)
Length of Stay in USA				
Part-life	21 (61.8%)	13 (38.2%)	7 (21.9%)	25 (78.1%)*
Full-life	25 (68.0%)	19 (43.2%)	20 (45.5%)	24 (54.5%)

*p<.05

Table 26: Acculturation and Physical Activity

Acculturation	Physical Activity			
	Vigorous Activity		Overall Activity	
	Insufficient (N=20)	Sufficient (N=56)	Insufficient (N=18)	Sufficient (N=58)
Acculturation 3.16 (SD=1.4)	2.95 (SD=1.31)	3.24 (SD=1.41)	3.06 (SD=1.34)	3.20 (SD=1.41)
Length of Stay in USA				
Part-life	8 (24.2%)	25 (75.8%)	6 (18.2%)	27 (81.8%)
Full-life	12 (68.0%)	31 (72.1%)	12 (27.9%)	31 (72.1%)

Knowledge/Self-Efficacy and Health Behaviors

Research Question 4: How are knowledge and self-efficacy associated with Chinese children's dietary behavior and physical activity?

Hypothesis 4-a: Children with a higher knowledge score will be more likely to have healthier dietary behaviors.

This hypothesis is partly accepted. The results shown in Table 27 revealed that there was a significant relationship between knowledge and fast-food intake ($p<.05$), but no similar relationship was found between knowledge and vegetable/fruit dietary intake ($p>.05$). Children who did not eat fast-food had a higher knowledge score (Mean=9.13, SD=3.55) than children who ate fast-food (Mean=7.76, SD=3.09).

Hypothesis 4-b-i: Children with a higher self-efficacy score will be more likely to have healthier dietary behavior.

This hypothesis is rejected. The results showed that there was no significant relationship between the self-efficacy and children's dietary behaviors (Table 27).

Hypothesis 4-b-ii: Children with a higher self-efficacy score will be more likely to be physically active.

This hypothesis is partly accepted. The Mann-Whitney U test showed that there was not a relationship between self-efficacy and children's overall activity at an approaching significance level ($p<.10$), and self-efficacy was found significantly related to children's vigorous activity ($p<.05$, Table 28). Children who engaged in insufficient vigorous activity had lower self-efficacy (Mean=.67, SD=2.37) than children who engaged in sufficient vigorous activity (Mean=1.81, SD=3.03).

Table 27: Dietary Knowledge/Self-Efficacy and Dietary behavior

	Dietary Behavior			
	Vegetable/Fruit		Fast-food	
	< 5 servings/day (N=51)	≥ 5 servings/day (N=32)	No fast-food (N=30)	Having fast-food (N=50)
Knowledge 8.18 (SD=3.3)	8.48 (SD=3.44)	7.72 (SD=3.04)	9.13(SD=3.55)*	7.76 (SD=3.09)
Self-Efficacy 2.81 (SD=7.4)	1.98 (SD=6.92)	4.22 (SD=8.06)	3.77 (SD=7.00)	2.62 (SD=7.77)

*p<.05

Table 28: Physical Activity Self-Efficacy and Physical Activity

	Physical Activity			
	Vigorous Activity		Overall Activity	
	Insufficient (N=21)	Sufficient (N=59)	Insufficient (N=18)	Sufficient (N=58)
Self-Efficacy	.67 (SD=2.37)**	1.81 (SD=3.03)	.74 (SD=2.47)*	1.75 (SD=3.00)

* p<.10
**p<.05

Physical Environmental Factors and Health Behaviors

Research Question 5: How are physical environmental factors associated with Chinese children's dietary behavior and physical activity?

Hypothesis 5-a-i: Children who have healthy food available at home will be more likely to have healthy dietary behaviors than children who do not have healthy food available at home.

This hypothesis is rejected. The results showed that there was no relationship between healthy food availability and vegetable/fruit intake (Table 29).

Hypothesis 5-a-ii: Children who have fast food available at home will be more likely to have unhealthy dietary behaviors than children who do not have healthy food available at home.

This hypothesis is rejected. The results showed that there was no relationship between fast-food availability and fast-food intake (Table 29).

Hypothesis 5-b-i: Children who have playgrounds available close to home will be more likely to be physically active than children who do not have playgrounds available close to home.

This hypothesis is rejected. Chi-square showed that there was no significant correlation between the availability of playgrounds and vigorous/overall activity (Table 30).

Hypothesis 5-b-ii: Children who have recreation centers available close to home will be more likely to be physically active than children who do not have recreation centers available close to home.

This hypothesis is rejected. Chi-Square analysis showed that there were no significant correlations between the availability of recreation centers and vigorous/moderate activity (Table 30).

Hypothesis 5-c: Children who live in a perceived safe neighborhood will be more physically active than children who live in a perceived unsafe neighborhood.

This hypothesis is rejected. Chi-Square analysis showed that there were no significant correlations between the safety of the neighborhood and vigorous/moderate activity (Table 30).

Table 29: Food Availability and Dietary Behavior

Availability	Dietary Behavior	
Vegetable/Fruit	< 5 servings/day (N=51)	≥ 5 servings/day (N=32)
Unavailable	4 (44.4%)	5 (55.6%)
Available	47 (63.5%)	27(36.5%)
Fast-Food	No fast-food (N=30)	Having fast-food (N=50)
Unavailable	17 (42.5%)	23 (57.5%)
Available	13 (32.5%)	27 (67.5%)

Table 30: Activity Place Availability/Safety and Physical Activity

Activity Place	Physical Activity			
	Vigorous Activity		Overall Activity	
	Insufficient	Sufficient	Insufficient	Sufficient
Availability				
Recreation Center	N=21	N=58	N=19	N=60
Can go there by self	7 (24.1%)	22 (75.9%)	6 (20.7%)	23 (79.3%)
Parents drive or never go	14 (33.3%)	36 (62.1%)	13 (26.0%)	37 (74.0%)
Playground	N=20	N=58	N=18	N=60
Can go there by self	11 (22.0%)	39 (78.0%)	10(20.0%)	40 (80.7%)
Parents drive or never go	9 (32.1%)	19 (67.9%)	8 (28.6%)	20 (71.4%)
Safety	N=21	N=57	N=19	N=59
Unsafe	2 (28.6%)	5 (71.4%)	2 (28.6%)	5 (71.4%)
Somehow safe	8 (40.0%)	12 (60.0%)	7 (35.0%)	13 (65.0%)
Very safe	11 (21.6%)	40 (78.4%)	10 (19.6%)	41 (80.4%)

Hypothesis 5-d-i: Children who live in a big family will be more likely to have healthy dietary behaviors than children in a small family.

This hypothesis is rejected. There was no significant relationship between family size and children's dietary behaviors (Table 31).

Hypothesis 5-d-ii: Children living in a big family will be more likely to be physically active than children in a small family.

This hypothesis is rejected. There was no significant relationship between family size and children's physical activity (Table 32).

Hypothesis 5-d-iii: Children living in a three-generation family will be more likely to have healthier dietary behaviors than children in a two-generation family.

This hypothesis is rejected. There was no significant relationship between family generation and children's dietary behaviors (Table 31).

Hypothesis 5-d-iv: Children living in a three-generation family will be more likely to be physically active than children in a two-generation family.

This hypothesis is rejected. There was no significant relationship between family generation and children's physical activity (Table 32).

Table 31: Family Structure and Dietary Behavior

Family	Dietary Behavior			
	Vegetable/Fruit		Fast-food	
	< 5 servings/day	≥ 5 servings/day	No fast-food	Having fast-food
Size	N=47	N=32	N=29	N=49
	3.53 (SD=1.67)	3.63 (SD=2.01)	3.31 (SD=1.29)	3.71 (SD=2.06)
Generation	N=51	N=32	N=30	N=50
Two	40 (62.5%)	24 (37.5%)	24 (38.7%)	38 (61.3%)
Three	11 (57.9%)	8 (42.1%)	6 (33.3%)	12 (66.7%)

Table 32: Family Structure and Physical Activity

Family	Physical Activity			
	Vigorous Activity		Vigorous Activity	
	Insufficient	Sufficient	Insufficient	Sufficient
Size 3.57 (SD=1.8)	N=21	N=55	N=19	N=57
	3.24 (SD=1.14)	3.71 (SD=1.98)	3.32 (SD=1.16)	3.67 (SD=1.96)
Generation	N=21	N=59	N=19	N=61
Two	18 (29.0%)	44 (71.0%)	16 (25.8%)	46 (74.2%)
Three	3 (57.9%)	15 (83.3%)	3 (16.7%)	15 (83.3%)

Hypothesis 5-e-i: Children whose parents have college or above education will be more likely to engage in healthy dietary behaviors than children whose parents having less than high school education.

This hypothesis is rejected. There were no relationships between both parents' education level and children's dietary behaviors (Table 33).

Hypothesis 5-e-ii: Children whose parents have college or above education will be more likely to be physically active than children whose parents having less than high school education.

This hypothesis is rejected. Chi-square analysis showed that there were no significant correlations between the parent's education and children's physical activity (Table 34).

Hypothesis 5-f-i: Family members/guardians providing after school care will be positively associated with children's dietary behavior.

This hypothesis is partly accepted. The results showed that there was a significant relationship between family members/guardians providing after school care and children's vegetable/fruit intake ($p \leq .05$) but no similar results were found on fast-food intake (Table 35).

Hypothesis 5-f-ii: Family members/guardians providing after school care will be positively associated with children's physical activity.

This hypothesis is rejected. Chi-square analysis showed that there were no significant correlations between the family members/guardians providing after school care and physical activity among the children who went outside to play (Table 36).

Table 33: Parent's Education and Dietary Behavior

Education	Dietary Behavior			
	Vegetable/Fruit		Fast-food	
	< 5 servings/day	≥ 5 servings/day	No fast-food	Having fast-food
Mother's	N=48	N=30	N=27	N=48
≤High School	17 (65.4%)	9 (34.6%)	7 (29.2%)	17 (70.8%)
≥ College	31 (59.6%)	21 (40.4%)	20 (39.2%)	31 (60.8%)
Father's	N=48	N=30	N=27	N=48
≤High School	9 (52.9%)	8 (47.1%)	3 (20.0%)	12 (80.0%)
≥ College	39 (63.9%)	22 (36.1%)	24 (40.0%)	36 (60.0%)

Table 34: Parent's Education and Physical Activity

Education	Physical Activity			
	Vigorous Activity		Vigorous Activity	
	Insufficient	Sufficient	Insufficient	Sufficient
Mother's	N=19	N=57	N=17	N=59
≤High School	6 (24.0%)	19 (76.0%)	5 (20.0%)	20 (80.0%)
≥ College	13 (25.5%)	38 (74.5%)	12 (23.5%)	39 (76.5%)
Father's	N=20	N=56	N=18	N=58
<High School	5 (31.3%)	11 (68.8%)	4 (25.0%)	12 (75.0%)
≥ College	15 (25.0%)	45 (75.0%)	14 (23.3%)	46 (76.7%)

Table 35: Family Member after School Care and Dietary Behavior

At home After School	Dietary Behavior			
	Vegetable/Fruit		Fast-food	
	< 5 servings/day (N=51)	≥ 5 servings/day (N=32)	No fast-food (N=30)	Having fast-food (N=50)
No Parents or Grandparent	16 (80.0%)	4 (20.0%)*	6 (30.0%)	14 (70.0%)
Parents or Grandparent	35 (55.6%)	28 (44.4%)	24 (40.0%)	36 (60.0%)

*$p \leq .05$

Table 36: Family Member after School Care and Physical Activity

Take Outside to Play	Physical Activity			
	Vigorous Activity		Vigorous Activity	
	Insufficient (N=13)	Insufficient (N=53)	Insufficient (N=30)	Insufficient (N=50)
Nobody	3 (13.0%)	23 (87.0%)	3 (13.0%)	23 (87.0%)
Person other than Family Members	5 (27.8%)	13 (72.2%)	5 (27.8%)	13 (72.2%)
Family Members	5 (20.0%)	20 (80.0%)	4 (16.0%)	21 (84.0%)

Social Environmental Factors and Health Behaviors

Research Question 6: How are social environmental factors associated with Chinese children's dietary behavior and physical activity?

Hypothesis 6-a-i: Perceived parents' social reinforcement will be positively associated with children's dietary behavior.

This hypothesis is rejected. There was no relationship between parents' social reinforcement and children's dietary behaviors (Table 37).

Hypothesis 6-a-ii: Perceived teachers' social reinforcement will be positively associated with children's dietary behavior.

This hypothesis is rejected. There was no relationship between teachers' social reinforcement and children's dietary behaviors (Table 37).

Hypothesis 6-a-iii: Perceived friends' social reinforcement will be positively associated with children's dietary behavior.

This hypothesis is rejected. There was no relationship between friends' social reinforcement and children's dietary behaviors (Table 37).

Hypothesis 6-b-iv: Perceived support will be positively associated with children's physical activity.

This hypothesis is rejected. There was no significant difference of perceived support between the children having sufficient moderate activity and those having insufficient moderate activity (Table 38).

Table 37: Social Reinforcement and Dietary Behavior

Social Reinforcement	Dietary Behavior			
	Vegetable/Fruit		Fast-food	
	< 5 servings/day (N=48)	≥ 5 servings/day (N=32)	No fast-food (N=29)	Having fast-food (N=48)
Parents 2.95 (SD=3.0)	2.46 (SD=4.08)	3.69 (SD=3.54)	2.72 (SD=3.88)	3.08 (SD=4.04)
Teachers -4.20 (SD=4.2)	-3.83 (SD=4.44)	-4.75 (SD=3.76)	-4.24 (SD=4.12)	-4.04 (SD=4.35)
Friends -5.08 (SD=3.0)	-4.83 (SD=3.17)	-5.44 (SD=2.68)	-4.86 (SD=3.11)	-5.21 (SD=3.01)

Table 38: Perceived Support and Physical Activity

	Physical Activity			
	Vigorous		Overall	
	Insufficient (N=17)	Sufficient (N=53)	Insufficient (N=15)	Sufficient (N=55)
Perceived Support 7.18 (SD=5.95)	5.76 (SD=6.85)	7.81 (SD=5.52)	7.24 (SD=5.99)	7.50 (SD=5.76)

Personal Factors and Environmental Factors

Research Question 7: How are personal factors related to environmental factors?

Hypothesis 7-a-i: Social reinforcement will be positively associated with children's dietary knowledge.

Because children received very little social reinforcement from teachers and friends (i.e. both the reinforcement scores are negative), only the parents' social reinforcement was used in the analysis for this hypothesis. This hypothesis is partly accepted. Parents' social reinforcement was positively associated with children's dietary knowledge at an approaching significance level ($p<.10$, Table 39). Spearman's Rho correlation coefficient was .21.

Hypothesis 7-a-ii: Social reinforcement will be positively associated with children's dietary self-efficacy.

Similarly, only the parents' social reinforcement was used in the analysis for this hypothesis. This hypothesis is accepted. Social reinforcement from parents was positively associated with children's dietary self-efficacy ($p<.05$, Table 39). Spearman's Rho correlation coefficient was .22.

Hypothesis 7-a-iii: Perceived support will be positively associated with children's physical activity self-efficacy.

This hypothesis is rejected. Perceived support was not associated with children's physical activity self-efficacy (Table 39).

Table 39: Social Environmental Factors and Personal Factors

Social Environmental Factors	Personal Factors		
	Dietary Knowledge 8.18 (SD=3.29)	Dietary Self-efficacy 2.81 (SD=7.38)	Physical Activity Self-efficacy 1.51 (SD=2.86).
Parent's Social Reinforcement 2.95 (SD=3.89)	r_s=.214 p=.057*	r_s=.224 p=.045**	
Perceived Support 7.18 (SD=5.95)			r_s=.026 p=.831

*p<.10
**p<.05

Hypothesis 7-b-i: Parent's education level will be positively associated with children's dietary knowledge.

This hypothesis is partly accepted. Children whose fathers have college or higher education were more likely to have higher dietary knowledge scores than children whose fathers have high school or less education ($p<.05$, Table 40).

Hypothesis 7-b-ii: Parent's education level will be positively associated with children's dietary self-efficacy.

This hypothesis is partly accepted (Table 40). Children whose mothers have college or higher education are more likely to have higher dietary self-efficacy scores than children whose mothers had high school or less education ($p<.05$). Similar results were found for children fathers' education at an approaching significance level ($p<.10$).

Hypothesis 7-b-iii: Parent's education level will be positively associated with children's physical activity self-efficacy.

This hypothesis is accepted (Table 40). Children whose mothers or fathers had college or higher education are significantly more likely to have higher physical activity self-efficacy scores than children whose mothers had high school or less education ($p<.05$).

Table 40: Parents' Education and Personal Factors

Parents' Education	Personal Factors		
	Dietary Knowledge 8.18 (SD=3.29)	Dietary Self-efficacy 2.81 (SD=7.38)	Physical Activity Self-efficacy 1.51 (SD=2.86).
Mother			
High School or less (25)	7.36 (SD=3.70)	.01 (SD=8.35)	.12 (SD=3.24)
College or above (52)	8.65 (SD=3.12)	4.26 (SD=6.63)**	2.36 (SD=2.31)**
Father			
High School or less (17)	6.53 (SD=3.61)	.18 (SD=6.52)	.29 (SD=2.47)
College or above (60)	8.72 (SD=3.14)**	3.68 (SD=7.60)*	1.89 (SD=2.84)**

*: $p<.10$
**: $p<.05$

The bivariate relationships between personal/environmental factors and health behaviors are summarized in Table 41, and the bivariate relationships between personal and environmental factors are summarized in Table 42. Length of stay in USA, dietary knowledge, father's education level, and family providing after school care are significant factors associated with children's dietary behavior ($p<.05$). Physical activity self-efficacy is the only significant factor related to children's physical activity ($p<.05$), though gender plays a role at an approaching significance level ($p<.10$). The factors with p-values less than .25 were also presented in the tables. The multivariate analysis included all the factors with p-values less than .25, and the results are presented in the next section.

Table 41: Summary of the Bivariate Relationships between Personal, Environmental Factors and Behaviors

Independent Variables	Dependent Variables			
	Vegetable/ Fruit Intake	Fast-food Intake	Vigorous Activity	Overall Activity
Personal Factors				
Demographics				
Age				
Gender			**	
Acculturation		*		
Length of Stay in USA		***		
Knowledge	*	***		
Self-efficacy				
Dietary self-efficacy	*			
Physical activity self-efficacy			***	**
Environmental factors				
Physical environment				
Fruit availability				
Fast-food availability				
Playground availability				
Recreation Center availability				
Neighborhood safety				
Family size				
Family generation				
Mother's education level				
Father's education level	*			
Family Members providing after school care	***			
Family Members taking outside to play				
Social environment				
Social Reinforcement				
Parents	*			
Teachers				
Friends				
Perceived Support				*

* p<.25
** p<.10
*** p<.05

Table 42: Summary of the Bivariate Relationships Between Personal Factors and Environmental Factors

	Personal Factors		
	Dietary Knowledge	Dietary self-efficacy	Physical activity self-efficacy
Environmental factors			
Reinforcement From Parents	**	***	
Social Support			
Mother's education level	*	***	***
Father's education level	***	**	***

*p<.25
**p<.10
***p<.05

Multivariate Relationships

Multivariate analysis was employed to answer research question #1: Does the SCT model predict Chinese children's dietary behavior and physical activity? The dependent variables (i.e. health behaviors) were dichotomized into healthy and unhealthy for the model. The details of the dichotomized health behaviors are shown in Table 22. Based on the results of the bivariate analysis, the factors that were associated with the behaviors at $p<.25$ level or lower were used in the multivariate analysis. Due to the small sample size of the current study, at most three independent variables were included in the model for each dependent variable after controlling for age and gender. The alpha level for the logistic regression was set at .10.

Models for Health Behaviors and Personal Factors

The independent variables included in the model for predicting vegetable/fruit intake were knowledge, self-efficacy and length of stay in the U.S. (Table 43). Dietary knowledge was dichotomized into passing score (i.e. having seven or more correct answers out of 13 questions) versus non-passing score. Dietary self-efficacy was dichotomized into positive self-efficacy (i.e. sum score was positive) versus negative self-efficacy. Length of stay in the U.S. was dichotomized into living in U.S. since birth versus at least having spent one year overseas. The logistic regression model identified no significant predictors for vegetable/fruit intake.

The independent variables included in the model for predicting fast-food intake were knowledge, self-efficacy and length of stay in the U.S.A (Table 43). The logistical regression model identified one significant predictor, length of stay in the U.S. for fast-food intake. Children who had lived overseas for at least one year were three times more

likely to eat fast-food on a regular basis than those who had stayed in U.S. since birth (OR=3.02, 90% CI=1.19-7.72, p=.051).

The independent variables included in the model for predicting vigorous activity were self-efficacy, acculturation and length of stay in U.S.A (Table 43). Acculturation was dichotomized into less acculturated (score of 3 or less) and more acculturated (score of 4 or more). The logistical regression model identified three significant predictors, self-efficacy, age and gender. Children with positive self-efficacy were five times more likely to engage in sufficient vigorous activity than children with negative self-efficacy (OR=5.34, 90% CI=1.90-15.53, p=.008). Younger children were three times more likely to engage in sufficient vigorous activity than older children (OR=3.20, 90% CI=1.06-9.71, p=.08). Boys were three times more likely to engage in sufficient vigorous activity than girls (OR=3.27, 90% CI=1.19-8.97, p=.05).

The independent variables included in the model for overall activity were self-efficacy, acculturation and length of stay in the U.S.A (Table 43). The logistical regression model identified two significant predictors, self-efficacy and age. Children with positive self-efficacy were five times more likely to engage in sufficient overall activity than children with negative self-efficacy (OR=5.74, 90% CI=1.95-.16.93, p=.008). Younger children were three times more likely to engage in sufficient overall activity than older children (OR=3.72, 90% CI=1.03-9.82, p=.09).

Table 43: Logistic Regression Models for Health Behaviors and Personal Factors

Dependent Variables	Independent Variables	Reference	β	SE of β	OR	90% CI for OR	
						Lower	Upper
Vegetable/Fruit Intake	Age	6-12yrs=0 13-18yrs=1	-.526	.570	.591	.231	1.509
	Gender	Boy=0 Grill=1	-.166	.497	.847	.374	1.920
	Dietary Knowledge	Non pass=0 Pass=1	-.526	.555	.537	.216	1.337
	Dietary Self-efficacy	Negative=0 Positive=1	.088	.599	1.092	.407	2.924
	Length of Stay in USA	Whole life=0 Not whole life=1	-.109	.512	.896	.386	2.080
Fast-Food Intake	Age	6-12yrs=0 13-18yrs=1	-.330	.605	.719	.266	1.945
	Gender	Boy=0 Grill=1	-.352	.526	.703	.296	1.671
	Dietary Knowledge	Non pass=0 Pass=1	-.736	.611	.479	.175	1.309
	Dietary Self-efficacy	Negative=0 Positive=1	.317	.672	1.373	.455	4.149
	Length of Stay in USA*	Whole life=0 Not whole life=1	1.108	.569	3.029	1.188	7.722
Vigorous Activity	Age*	13-18yrs=0 6-12yrs=1	1.164	.675	3.202	1.056	9.713
	Gender*	Grill=0 Boy=1	1.184	.614	3.267	1.190	8.967
	Physical Activity Self-efficacy**	Negative=0 Positive=1	1.693	.638	5.434	1.902	15.527
	Acculturation	Less =0 More=1	1.164	.770	.794	.224	2.819
	Length of Stay in USA	Whole life=0 Not whole life=1	.486	.777	1.626	.453	5.834
Overall Activity	Age*	13-18yrs=0 6-12yrs=1	1.155	.687	3.175	1.026	9.823
	Gender	Grill=0 Boy=1	.915	.632	2.497	.883	7.060
	Physical Activity Self-efficacy **	Negative=0 Positive=1	1.748	.657	5.743	1.948	16.929
	Acculturation	Less =0 More=1	-.425	.800	.654	.175	2.438
	Length of Stay in USA	Whole life=0 Not whole life=1	.784	.826	2.190	.563	8.518

*p<.10

**p<.05

Models for Health Behaviors and Environmental Factors

The independent variables included for the models of predicting dietary behaviors were food availability, after school care, and reinforcement from parents, controlling for age and gender. No significant predictors were identified (Table 44).

The independent variables included for the models of predicting physical activity were recreation center availability, playground availability, and perceived social support controlling for age and gender (Table 44). The logistical regression model identified two significant predictors, social support and gender for vigorous activity. Children perceiving positive social support were four times more likely to engage in vigorous activity than children perceiving negative social support (OR=4.02, 90% CI=1.10-14.66, p=.08). Boys were three times more likely to engage in vigorous activity than girls (OR=2.98, 90% CI=1.08-8.23, p=.08). The logistical regression model identified social support as the significant predictor for overall activity. Children who perceived positive social support were five times more likely to engage in overall activity than children who perceived negative social support (OR=4.96, 90% CI=1.37-17.94, p=.04).

Table 44: Logistic Regression Models for Health Behaviors and Environmental Factors

Dependent Variables	Independent Variables	Reference	β	SE of β	OR	90% CI for OR	
						Lower	Upper
Vegetable/Fruit Intake	Age	6-12yrs=0 13-18yrs=1	-.296	.542	.744	.305	1.815
	Gender	Boy=0 Girl=1	-.077	.490	.926	.414	2.072
	Fruit availability	Unavailable=0 Available=1	-.688	.491	.502	.224	1.126
	Family member available after school	No=0 Yes=1	1.022	.639	2.779	.971	7.953
	Parents reinforcement	Negative=0 Positive=1	.519	.583	1.681	.645	4.383
Fast-Food Intake	Age	6-12yrs=0 13-18yrs=1	.005	.526	1.005	.423	2.390
	Gender	Boy=0 Girl=1	-.292	.486	.747	.336	1.662
	Fast-food availability	Unavailable=0 Available=1	.674	.806	1.961	.521	7.379
	Family member available after school	No=0 Yes=1	-.524	.576	.592	.230	1.526
	Parents reinforcement	Negative=0 Positive=1	.055	.573	1.056	.412	2.709
Vigorous Activity	Age	13-18yrs=0 6-12yrs=1	-.244	.711	.784	.244	2.522
	Gender	Girl=0 Boy=1	1.092	.618	2.980	1.079	8.231
	Recreation Center Availability	No=0 Yes=1	-.049	.072	.952	.845	1.073
	Playground Availability	No=0 Yes=1	-.101	.063	.904	.815	1.002
	Perceived Social Support*	Negative=0 Positive=1	1.391	.787	4.018	1.101	14.658
Overall Activity	Age	13-18yrs=0 6-12yrs=1	-.009	.750	.991	.288	3.404
	Gender*	Girl=0 Boy=1	.722	.637	2.058	.722	5.867
	Recreation Center Availability	No=0 Yes=1	-.064	.078	.938	.826	1.066
	Playground Availability	No=0 Yes=1	-.092	.065	.912	.820	1.015
	Perceived Social Support**	Negative=0 Positive=1	1.601	.782	4.956	1.369	17.944

* P<.10
**P<.05

Models for Health Behaviors and Personal/Environmental Factors

Based on the above models, significant predictors or predictors at approaching significance levels were chosen to create best fit models for health behaviors that included both personal and environmental factors (Table 45). The independent variables included for the model of predicting vegetable/fruit intake were length of stay in the U.S., dietary self-efficacy, and after school care. The independent variables included for the model of fast-food intake were length of stay in the U.S., fast-food availability, and reinforcement from parents. The independent variables included for the models of vigorous activity and overall activity were recreation center availability, exercise self-efficacy, and perceived social support. All the analyses were controlled for age and gender.

After school homecare was identified as the significant predictor for vegetable/fruit intake. Children with family member(s) at home after school were three times likely to have more than five servings of vegetable/fruit intake per day than those who had no one at home after school (OR=3.56, 90% CI=1.26-10.03, p=.04). Length of stay in the U.S. for fast-food intake was identified as the significant predictor for fast-food intake. Children who had lived overseas for at least one year were three times more likely to eat fast-food on a regular basis than those had lived in the U.S. since birth (OR=3.41, 90% CI=1.33-8.77, p=.03).

The logistical regression model identified one significant predictor, self-efficacy, for vigorous activity. Children with positive self-efficacy were three times more likely to engage in sufficient vigorous activity than children with negative self-efficacy (OR=3.29, 90% CI=1.16-9.31, p=.06). The logistical regression model identified self-efficacy and

social support as the significant predictors for overall activity. Children with positive self-efficacy were three times more likely to engage in sufficient overall activity than children with negative self-efficacy (OR=3.00, 90% CI=1.03-8.77, p=.09). Children perceiving positive social support were four times more likely to engage in overall activity than children perceiving negative social support (OR=4.58, 90% CI=1.22-.17.15, p=.06).

Table 45: Logistic Regression Models for Health Behaviors and Personal/Environmental Factors

Dependent Variables	Independent Variables	Reference	β	SE of β	OR	90% CI for OR	
						Lower	Upper
Vegetable/Fruit Intake	Age	6-12yrs=0 13-18yrs=1	-.389	.582	.678	.260	1.767
	Gender	Boy=0 Girl=1	.201	.491	1.222	.545	2.741
	Length of Stay in USA	Yes=0 No=1	-.165	.501	.848	.372	1.935
	Dietary Self-efficacy	Negative=0 Positive=1	-.017	.544	.983	.402	2.405
	Family member available after school **	No=0 Yes=1	1.269	.630	3.559	1.262	10.033
Fast-Food Intake	Age	6-12yrs=0 13-18yrs=1	-.332	.569	.718	.282	1.828
	Gender	Boy=0 Girl=1	.508	.519	1.662	.708	3.902
	Length of Stay in USA**	Whole life=0 Not whole life=1	1.228	.574	3.413	1.328	8.770
	Fast-food availability	Unavailable=0 Available=1	.517	.844	1.678	.418	6.729
	Parents reinforcement	Negative=0 Positive=1	.150	.637	1.161	.407	3.312
Vigorous Activity	Age	13-18yrs=0 6-12yrs=1	-.343	.751	.710	.207	2.440
	Gender	Girl=0 Boy=1	1.026	.623	2.789	1.001	7.769
	Physical Activity Self-efficacy*	Negative=0 Positive=1	1.189	.633	3.285	1.159	9.307
	Recreation Center Availability	No=0 Yes=1	-.065	.072	.937	.832	1.055
	Perceived Social Support	Negative=0 Positive=1	1.327	.816	3.771	.986	14.428
Overall Activity	Age	13-18yrs=0 6-12yrs=1	-.070	.794	.932	.253	3.440
	Gender	Girl=0 Boy=1	.641	.643	1.899	.659	5.467
	Physical Activity Self-efficacy*	Negative=0 Positive=1	1.099	.651	3.002	1.028	8.765
	Recreation Center Availability	No=0 Yes=1	-.075	.077	.928	.817	1.054
	Perceived Social Support*	Negative=0 Positive=1	1.522	.802	4.582	1.224	17.145

* P<.10
**P<.05

Findings of Interview with Mothers

Six families, including three from the Chinese Weekend School, were contacted, and four of them agreed to participate in the interview. Though the researcher expected that fathers would join the interview, only four mothers participated. All of the four interviews were conducted at the places where the mothers chose, such as their houses or working places. Two mothers had children enrolled in the Chinese Weekend School, while the children in another two families did not go to Chinese weekend school. For the purpose of description and protection of families' privacy, the two mothers in family having children in Chinese school are called mother A and mother B, while the other two mothers are called mother C and mother D. Mother A has one 15-year old boy and one almost 5-year old girl. Mother B has two boys, one 7-year old and one 3-year old. Mother C has one 17 year old boy while Mother D has one 16-year old girl, one 15-year old boy and one almost 6-year old girl. All the children except the two younger than 6 years old had completed the questionnaire. The interviews were conducted following the protocol (Appendix C). The mothers were asked the questions in the protocol, but their responses were not limited to the answers to the questions. The responses are summarized in the order of the questions.

General Responses

The mothers shared their experiences and insights about their children's eating, physical activity and the other relevant factors. They also raised their concerns on the issues. The most pervasive comment was the length of time that the parents can spend with the children, which was considered as the key factor of whether or not the parents can influence the children. Mothers said that preparing a healthy meal or taking a child to

participate in physical activity requires a lot of time, and not every parent is able to provide enough amount of time in daily life because of their jobs.

When asked what most influenced their child(ren)'s diet and physical activity, the mothers agreed that culture and family members influenced more on the dietary behavior, while environment greatly influenced children's physical activity. Children's knowledge, self-efficacy, and parent's education were not considered as significant factors. The mothers' responses were categorized as the following:

Culture

The mothers identified that culture influenced the dietary behavior greatly. The typical words they used were "traditional Chinese food" and "American food". One mother depicted the difference between Chinese food and American food.

Chinese meal has much more vegetables and we don't eat those dessert everyday after dinner like American do.

However, they also pointed out that even though they were cooking Chinese food at home "most of the time", children might not enjoy it as expected. Instead, the children were used to the American food.

He doesn't eat many vegetables.

He said that he felt uncomfortable after eating Chinese food...maybe it is because it is greasy and spicy.

One mother described how her son's taste shifted since he came to the USA.

He was not used to American diet when he just got here. He said American food is always fried chicken, junk food. He doesn't like eating it. Though he used to like it in China, when he heard from classmates that it was junk food, he stopped eating it. So, I think it is due to the culture. However, after a while, he found out that sandwich and pizza are not bad. Now he likes American food more than Chinese food. He doesn't like Chinese food anymore.

The mothers agreed that cultural differences influenced children's physical activity as well.

I think maybe like a typical traditional Chinese family, we don't pay much attention to many sports. People who came here are not those who have sport cells. I think American family pay more attention on that than Chinese family while we address more on children's academics and more education. PE is relatively weak in Chinese family.

American family let the children running outside like herding the sheep. And it doesn't matter whether they finish the homework or not. We Chinese family are more concerned about academic performance.

We rarely pay attention on raising their interest in sports. American, they always take the children to the sports game or to participate in children's activity. Therefore, children will have more interests in physical activity. But Chinese adults sometimes don't care about this, and children therefore do not have much interest in physical activity.

Knowledge and Self-efficacy

Children's knowledge and self-efficacy did not appear as the important factors in the mothers' response. Though the mothers said the children "know it well" or "know more than I do" about what is healthy to eat, the children had different choices when it came to them.

He would definitely not choose to eat vegetables.
He can initiate all the healthy eating himself now.

Environment

Environment appeared as one common influential factor that the mothers identified. Overall, the mothers would like to have the family living in a good neighborhood.

I think neighborhood is a very important factor in USA. If you choose a good neighborhood to live then it will have a big influence on children's exercise.

The mothers didn't express much concern on the safety of the neighborhood. They would like to let the children to go outside.

We don't worry about the safety much.
He goes out as a group and we know who his classmates are.
Usually, we are nearby.

Availability of food does not appear as an issue in Chinese family.

We have everything (to eat) at home.
We are never cheap on eating; basically we make sure they can eat what they want to eat.

Social Influence

The mothers found teachers and friends influenced their children differently.

Teachers have some influences. Teachers taught them what was in Soda/Coca, and told them that chocolate was like drug.
His friends have some influences. For example, they intend to eat the similar food. Sometimes, their influence even exceeds parent's influence.
Friends, neighbors, classmates, and schoolteachers said that KFC and McDonald were junk food. He heard it and might think it bad for eating. So he was influenced by it a lot.
The schoolteachers and classmates have big influence on his physical activity.

Parent's Influence

The mothers described their roles on children's eating and physical activities differently. Most of the mothers assessed themselves positively.

Encourage them to eat vegetables.
I have been talking to him about the advantage of eating vegetables and fruit all the time.
Take them out to play or will ask them to go out to play.

The parents' support was not considered associated with their education levels much.

It is not necessary that a mother with higher education level will do better. Loving heart is more important than education.
If a busy mother with higher education doesn't have time to take care the kid, the kid will eat junk food as well. If a mother, a housewife without higher education, is home all the time, she will pay attention to what the children need, the children's development. And she has more time to talk to the children about the food and nutrition.

Meanwhile, some mothers said there were still problems even though they have tried their best.

I don't have the time and she doesn't like to be with me.
My son never listens to me. He doesn't follow.

Concerns

Mothers' concerns were different case by case.

Limit his exercise, because he got hurt during the exercise.
I have to work and have no time to take care of the kids, but I don't like seeing her becoming fat.
I worry about something like mad cow disease or bird flu.

Better help

Mothers expressed their willingness and ideas on how to help the children better.

Let them know about the diet from the perspective of culture, Chinese culture...Raise their interest (of eating healthy) with all kinds of means.
Let them help cooking. Establish the concept of food and vegetables.
I want to send her to Chinese school.

School Lunch

Mothers seemed did not like the school lunch and indicated "school lunch is a problem".

The quantity and quality is relatively small and simple.
The lunchtime is too short for the children.
Most of the children dump the food at the end... They did not have enough for lunch so they were hungry when they come home like three or four clock in the afternoon.

The cooking is bad.

Food Pyramid

The mothers did not appear familiar with the food pyramid guide. They either "don't know about it" or "have heard a little about it". Whether or not the mothers have heard about the food guide pyramid, they have their own understanding on healthy eating.

Eat less sugar, need eat more vegetables and drink milk.
Too much fried food or meat is no good.
Three meals; eat regularly.

Fast-Food Restaurant

None of the families depended on fast-food restaurants for their regular meals, but most of them did take the children to there "once a week" or "occasionally". It appeared fast-food restaurants like McDonalds attracted younger children more than the older ones, though the older ones did go there to buy food when they were hungry after school.

Perceived Good Eating Habits

Eating vegetable was the number one issue addressed by the mothers. Milk was emphasized as well. One mother depicted that a Chinese meal with enough nutrition should have "meat, vegetables and soup served with rice". One mother suggested a brief daily menu for children:

Milk and egg for breakfast, Chinese meal if at home and sandwich if at school for lunch; Chinese meal for dinner.

Perceived Bad Eating Habits

Most of the mothers thought that their children were eating healthily. When asked how they pictured a bad eating habit; their responses fell into two categories. The first one was the variety of the food that the children can get. The second one was the way children eat. One mother commented, "a diet without variety is bad". Another mother said "one kind of food is never enough even if it is the best food". Regarding how children should eat their food, mothers gave two suggestions: do not overeat and do not be picky with food.

Exercise Habits

Most children were described as physically active. They had "20 to 40 minutes PE class everyday", and/or engaged in at least one sport "soccer", "basketball" or "swimming". The mothers showed their support by "driving the children around" or "sending them to sports club." The amount of children's exercises varied from "occasionally" to "everyday". Although shown as physically active in the conversations, some children engaged in some sedentary activity too.

He can stay there (watching TV or play computer game) three to four hours without moving at all.

The mothers had their concerns about physical activity. They worried about the danger that the children might encounter such as "having leg broken". One mother thought that one of her children needed more exercise.

It appeared that children, especially the older boys, planned their activity well. Mothers seemed not involved in their exercise much except for providing transportation.

He did not need me plan for him. He knows about the shape, muscles more than I do.

Balance and Limit

Balance and limit were the two words repeatedly mentioned by the mothers for both eating and physical activity.

The key is balance, and you have to control the amount (of what they eat).
You can eat much but you must exercise.
Exercise is good but only under the limit not hurting yourself.

Younger Children and Older Children

Mothers appeared treating the children differently according to their age. When the child was young, the mother "educated" more about healthy eating and exercise. While when the child became older, the mothers liked "communication".

When he was young, we kept talking to him on purpose that vegetable is good; eat less sugar, don't grow too fat.

Guide him when he was very young, but had to respect him when he was older.

Summary

The findings of the current study are somewhat explained by SCT with some concepts that are more significantly related than others. Sufficient vegetable/fruit intake was more likely in children cared by family members after school. Children's fast-food intake was more likely in children who lived in the U.S. for less time. Regular vigorous activity was more likely in children with self-efficacy and social support for exercise. Overall activity was also more likely in children with self-efficacy and social support for exercise.

CHAPTER V

DISCUSSION

The purpose of this study was to test the ability of the Social Cognitive Theory (SCT) to model how well personal and environmental factors relate to the dietary behaviors and physical activity of Chinese children from three cities in the Hampton Roads area. SCT defines human behavior as a triadic, dynamic, and reciprocal interaction of personal factors which include cognition, behavior, and the environment (Bandura, 1977, 1986, 1997). The expected predictors of these behaviors include personal factors such as demographics, acculturation, knowledge and self-efficacy, and environmental factors such as physical environment, reinforcement and social support. The health behaviors addressed in this study are dietary behavior and physical activity. The results showed that personal factors and environmental factors are related to health behaviors to different extents, revealing agreement with the findings of some previous studies and disagreement with some others. This chapter summarizes the current study, discusses the results, and makes recommendations.

Review of Social Cognitive Theory

The first research question of this current study is "does the SCT model predict Chinese children's dietary behavior and physical activity?" Findings from this study provide limited support for the use of SCT in explaining health behaviors. The findings support the use of SCT because the variables from personal construct (self-efficacy) and enviromental construct (social support) were found to be associated with health behaviors. The findings also support the association between personal construct (knowledge) and enviromental construct (parents' education). On the other hand, it

should be noted that not all behaviors were explained by the all the SCT constructs. In addition, how well acculturation fits in SCT is questionable. More work is needed on how to use SCT to model behaviors in immigrant groups.

The Social Cognitive Theory addresses the conception of *reciprocal determinism,* which considers that (a) personal factors in the form of cognition, affect, and biological events, (b)behavior, and (c) environmental influences create interactions that result in a *triadic reciprocality* (Bandura, 1986). From this theoretical perspective, human functioning is viewed as the product of a dynamic interplay of personal, behavioral, and environmental influences. For example, how people interpret the results of their own behavior informs and alters their environments and the personal factors they possess which, in turn, inform and alter subsequent behavior (Pajares, 2002). The reciprocal determinism of human functioning in SCT makes it possible to aim health education and health promotion efforts at personal, environmental, or behavioral factors (Pajares, 2002). Approaches for increasing well-being can be directed at adjusting emotional, cognitive, or motivational processes, improving behavioral competencies, or changing the social conditions under which people live and work (Pajares, 2002). For example, parents have the challenge of improving the quality of children's health life in the household. Using SCT as a framework, parents can work to improve their children's knowledge or skills about health behaviors (personal factors), improve children's eating habits or exercise habits (behaviors), and adjust the family environment to encourage healthy eating or more exercise (environmental factors). Findings of this study support the implementation of multiconstruct intervention with a strong enviromental aspect, which is recommended in SCT (Baranowski et al., 2002).

Environments and social systems influence human behavior through psychological mechanisms of the self system (Bandura, 1986). Hence, SCT posits that factors such as economic conditions, socioeconomic status, and educational and familial structures do not affect human behavior directly. Instead, they affect behavior to the degree that they influence people's aspirations, self-efficacy beliefs, personal standards, emotional states, and other self-regulatory influences (Pajares, 2002). Similarly, SCT indicates that individuals' construal processes and behaviors mutually reinforce each other (Bandura, 1986). One study found that prior exercise behavior predicted subsequent knowledge and self-efficacy, and prior knowledge and self-efficacy, in turn, predicted subsequent exercise behavior (Rimal, 2001). Therefore, to better understand how personal factors, enviromental factors and behaviors interact and influence each other, longitudinal research is needed.

Personal Factors and Health Behaviors

The second to fourth research questions were related to personal factors and health behaviors. Personal factors included in the current study are demographics, acculturation, knowledge, and self-efficacy. Bivariate analysis results showed that length of stay in USA and dietary knowledge are both significantly related to children's fast-food intake, while physical activity self-efficacy is significantly related to children's vigorous activity and overall activity. Other factors were found not to be significantly related.

Demographics

The second research question is "how are demographic variables associated with Chinese children's dietary behavior and physical activity?" The current study showed

that demographics including age and gender were not always significantly related to healthy behaviors. The findings are partly consistent with previous studies, which revealed that age is not a significant predictor for food intake (Nielsen et al., 2002). However, one study shows an increased tendency toward the consumption of energy-dense foods as the children's age increases, which is accountable to increasing autonomy as children grow (O'Brien & Bush, 1997). Unlike age, gender seems to play a role in children's dietary behavior as shown in previous studies (Cohen et al., 1990; Gustafson-Larson & Terry, 1992; Robinson, 1999). The current study did not confirm the previous findings. Overall, previous finding have not shown consistent relationships between demographics and dietary behaviors. Previous studies showed that both age and gender play a role in children's physical activity (Craig et al., 1996; Strauss et al., 2001). The findings of the currently study only supported gender's role at a significant level.

Existing research indicates that the determinants of levels of childhood physical activity and dietary behavior are complex. One study found that, for children aged 3-13 years old, the variables consistently associated with physical activity were sex (male), parental overweight status, physical activity preferences, intention to be active, perceived barriers (inversely related), previous physical activity, healthy diet, program/facility access, and time spent outdoors (J. Sallis et al., 2000). For adolescents 13-18 years old, some of the variables found consistently associated with physical activity were slightly different from those for younger children. Variables included sex (male), ethnicity (white), age (inversely related), perceived activity competence, intentions, depression (inversely related), previous physical activity, community sports, sensation seeking, sedentary behaviors after school and on weekends (inversely related), parent support,

support from others, sibling physical activity, direct help from parents, and opportunities to exercise (J. Sallis et al., 2000). Demographics alone cannot explain the variety of behaviors. Therefore most investigators have focused on other personal factors such as knowledge and self-efficacy.

Acculturation

The third question is, "how is acculturation associated with Chinese children's dietary behavior and physical activity?" Contrary to the researcher's expectation, the results showed that length of stay in the U.S. was found to be significantly negatively related to the children's fast-food intake, i.e., the longer the child stayed in the U.S., the less likely he/she was to eat fast-food. As a fast developing country, China increasingly embraces the outside world and its food industry, with U.S. fast-food chains expanding in China, the world's biggest market. The fast-food chains bring the exotic culture of the U.S. to Chinese people who have never had a chance to travel overseas, thus those restaurants are a popular entertainment place for special occasions in China. New immigrants might find it thrilling that they can access fast-food so easily and cheaply when they arrive in the States. This might be a possible explanation of higher consumption of fast-food within new immigrant groups of the current study. This finding partly confirms one previous study, in which the researcher found that in a less-acculturated sample, most participants reported some Western dietary practices, such as eating at Western fast-food restaurants (56%), and eating between meals (72%) (Satia et al., 2001). However, it indicates that acculturation is a complex factor related to behaviors.

Researchers indicate that acculturation is associated with changes in dietary behaviors within the Chinese-American population (Liou & Content, 2001; Satia, Patterson, Kristal et al., 2002; Satia, Patterson, Neuhouser et al., 2002; Saunders et al., 1997; Schultz et al., 1994). Researchers have found that dietary changes were related to length of exposure to the new environment, ability of the immigrants to speak or read the new language, social contact with people of the new culture, and a greater involvement in extracurricular activities and educational programs (G. P. Ho, Nolan, & Dodds, 1965; Yang & Fox, 1979). Younger immigrants generally tended to change their food habits more readily than older immigrants (G. P. Ho et al., 1965; Wu-Tso et al., 1995), and men were more likely to change their food habits than women (who had more experience preparing traditional cuisine) (Gupta, 1975). One recent study showed that Chinese-Americans increased consumption frequency of all seven food groups (grains, vegetables, fruits, meat/meat alternatives, dairy products, fats/sweets, and beverages) and Western foods while consumption frequency of traditional Chinese foods decreased after immigration (Nan & Cason, 2004). Higher education and higher income levels were associated with a larger increase in consumption frequency of grains, vegetables, and fruits. Persons who resided in the United States for longer periods of time showed a greater increase in their consumption frequencies of vegetables, fats/sweets, and beverages. Persons with better English proficiency had a greater increase in their consumption frequency of grains, fruits, meat/meat alternatives, and fats/sweets (Nan & Cason, 2004). Therefore, length of stay alone is not adequately accountable enough for the fast-food intake. The family social economic status, parent education level, and how children try to fit into the new peer group should be taken under consideration.

Knowledge

The fourth research question is, "how are knowledge and self-efficacy associated with Chinese children's dietary behavior and physical activity?" Dietary knowledge was found to be significantly related to fast-food intake and likely associated with vegetable/fruit intake. In other words, knowledge appears not to cue children to eating healthy food, but to not eating unhealthy food. This finding addresses the threat of children's social desirablity, for children might have known what the parents and the research expected. Previous studies showed inconsistent findings on the relationship between knowledge and dietary behavior (Berg et al., 2002; Nowak & Buttner, 2003; Shufflebarger et al., 1998). The results indicate that knowledge by itself does not necessarily ensure that children engage in self-practicing healthy lifestyle behaviors. The interview with mothers showed that Chinese parents were not familiar with the food pyramid guide or dietary guidelines, nor did they adhere to it. This raises an interesing question: does knowing and/or adhering to food pyramid or dietary guidelines lead to a healthier life? Previous studies suggested that adherence to the 1995 *Dietary Guidelines for Americans*, as measured by the Healthy Eating Index calculated by a food-frequency questionnaire (HEI-f), was weakly associated with risk of major chronic disease and had limited benefit in preventing major chronic disease in women and men (McCullough, Feskanich, Rimm et al., 2000; McCullough, Feskanich, Stampfer et al., 2000). In a later study by these researchers, they found that the dietary pattern represented by the Alternate Healthy Eating Index (AHEI) predicted lower incidence of major chronic disease in men and women and was related to important reductions in cardiovascular disease (CVD) risk (McCullough et al., 2002). The AHEI is the improved version of HEI

in which several aspects of the original HEI were incorporated in order to correspond to existing dietary guidelines (e.g. to increase fruit and vegetable intakes). The AHEI also provides quantitative scoring for qualitative dietary guidance (e.g., choose more fish, poultry, and whole grains, and if you drink alcohol, do so in moderation). The findings suggested that simple improvements to the dietary guidelines may decrease the risk of major chronic disease (McCullough et al., 2002). Although the *Dietary Guidelines for Americans* were updated recently with some improvements (U.S. Department of Health and Human Services & U.S. Department of Agriculture, 2000), the HEI and the food guide pyramid currently remain unchanged. The weaker findings associated with the HEI suggested that dietary guidelines in general need to include both messages to consume more of certain foods (e.g., fruit, vegetables, and whole grains) and messages aimed at the quality of nutrient sources (e.g., consume more unsaturated than saturated fats, and eat more white meat than red meat) (McCullough et al., 2002).

Regardless of knowledge of dietary guidelines, the Chinese families tried to maintain traditional dietary habits according to their own dietary knowledge, i.e. consume more whole grains, vegetables, and fruit. The traditional Chinese diet is considered well-balanced with high fiber and low saturated fats (Newman, 1985). A typical Chinese diet usually includes a carbohydrate product such as rice, noodles, or steamed buns, joined with stir-fried vegetable and soups that represent other food groups. Hot tea, fresh fruit, and nuts, instead of sweets, are typically served after the meal (Newman, 1985). After Chinese persons immigrate to the United States, they adopt Western eating habits while maintaining traditional Chinese eating habits, rather than rejecting either one of them (Koo, 1984). The findings of 24-hour diet recall in the current study corresponded with

the literature, in which carbohydrate products were the main consumption of food the day previous to the survey.

Self-Efficacy

The fourth research question is, "how are knowledge and self-efficacy associated with Chinese children's dietary behavior and physical activity?" The results of the current study showed that physical activity self-efficacy is a significant factor related to children's physical activity, and related to overall activity at approaching significance levels. This finding is consistent with many previous studies which suggested that self-efficacy is an important correlate of physical activity participation (DiLorenzo et al., 1998; Dishman et al., 1985; Duncan & McAuley, 1993; Dwyer et al., 1998; J. Sallis, Alcaraz et al., 1992; J. Sallis et al., 1989). The direction of the relationship is also consistent: the higher one's physical activity self-efficacy is, the more likely he/she will engage in the physical activity. The current study found that there is not a significant relationship between dietary self-efficacy and dietary behaviors. This is not consistent with previous studies that suggest dietary self-efficacy is a strong predictor of dietary behaviors (E. S. Anderson et al., 2000; Brug et al., 1997; Gracey et al., 1996; Milligan et al., 1997; Schwarzer & Renner, 2000). The small sample size of the current study might contribute to this inconsistency.

Environmental Factors and Health Behaviors

Physical Environment

The fifth research question is, "how are physical environmental factors associated with Chinese children's dietary behavior and physical activity?" Physical environmental factors such as availability, safety, and family structure did not play a significant role in

children's health behaviors, which is not consistent with the findings of previous studies. One previous study showed that weekend and total weekly fruit and vegetable consumption was significantly associated with home availability and access while weekday consumption was not (Hearn et al., 1998). Access to physical activities or nearby play space, such as the location of parks and schools, and opportunities to participate in games or sports were found to affect sports involvement (Greendorfer & Ewing, 1981; J. Sallis et al., 1990; J. Sallis et al., 1993). Possible reasons for the insignificant findings in the current study are flaws existing in the data collection. One flaw is that the questions concerning the variables were over-simplified. Another flaw is that the sample size was too small. Moreover, Chinese families place children's academic performance as the top priority (D. Y. F. Ho, 1986), therefore, the children might not be able to go out to play before they finish their homework and extra work the parents give to them even though playgrounds or recreation centers are available.

The role of family appeared to be important. The results showed that whether or not parents or grandparents were at home made a difference in children's vegetable/fruit intake. Sallis et al (1988) addressed the influence of the family environment and indicated that health behaviors tend to aggregate within families. Traditional Chinese families are authoritarian and hierarchical, with the dominance of elders and men (D. Y. F. Ho, 1987). Fathers and mothers may be involved equally in childrearing in Chinese families. However, fathers and mothers may assume different socialization duties and interact with children in different manners (D. Y. F. Ho, 1987). Specifically, like their Western counterparts (Larson & Richards, 1994; Parke & Buriel, 1998), Chinese mothers are often regarded as important for providing care and affection to the child (D. Y. F. Ho,

1987). It has been found that in Chinese families, children are more likely to turn to mothers for emotional support, physical needs, and help in dealing with problems of daily life (Su, 1968). It is no surprise that only mothers agreed to participate in the interviews of this study when the families were contacted. Unlike Western fathers, who often interact with children as playmates, Chinese fathers rarely engage in play activities with their children (D. Y. F. Ho, 1987; Roopnarine, Lu, & Ahmdezzaman, 1989). The role of the father as the authority figure in the family is mainly to help children achieve in academic areas, learn societal values, and develop appropriate behaviors (D. Y. F. Ho, 1986).

Social Environment

The sixth research question is, "How are social environmental factors associated with Chinese children's dietary behavior and physical activity?" The social factors addressed in this current study were perceived support and social reinforcement. Perceived support was found strongly related to children's vigorous and overall physical activity. Many studies that have examined the relationship between physical activity and social support have found a strong positive association. This relationship has been studied in both cross-sectional and prospective studies (DiLorenzo et al., 1998; J. Sallis, Hovell et al., 1992). Friends and family support have been consistently found to influence participation in physical activity across a wide range of population groups, while lack of social support from friends and family is associated with lower levels of physical activity (Stahl et al., 2001). Studies show that parental inactivity strongly predicts child inactivity (Fogelholm, Nuutinen, Pasanen, Myohanen, & Saatela, 1999; Gottlieb & Chen, 1985). A recent study examined the relationship between changes in

young girls' weight status and their parent's self-reported physical activity and dietary intake patterns. It revealed that the weight status of girls with parents having higher dietary intake and less physical activity had significantly increased over two years than girls with parents having lower dietary intake and more physical activity (Davison & Lipps Birch, 2002).

Unlike the perceived support, social reinforcement did not have the similar influence on children's dietary behaviors in the current study. This finding is similar to the results of the relationship between knowledge and dietary behavior. Children have been shown receiving reinforcement from parents for dietary behavior, but the reinforcement itself is not strong enough to make the children take action. Reinforcement, as measured in this study, was what the parents, teacher and friend said, while perceived support was what they did. It seems that action support is stronger than verbal reinforcement.

Personal Factors and Environmental Factors

The last research question is, "how are personal factors related to environmental factors?" The current study found children's knowledge and self-efficacy were related to parents' education level and reinforcement from the parents. This confirms previous studies which showed that knowledge or self-efficacy may mediate between social influences and healthy eating habits of adults, for example, to choose appropriately and avoid overeating (Duncan & McAuley, 1993; Shannon et al., 1990; Slater, 1989). Family social influences were expected to be greater for children than for adults, because children are dependent on parents for access to food and support of exercise-related activities (Baranowski, 1997). No direct evidence in previous studies showed a

relationship between parental education level and children's health knowledge. The current study showed that parental education level played an important role in children's knowledge and self-efficacy. However, the mothers interviewed in the current study did not agree that parents' education level was important for children's health behaviors. Mothers pointed out that love and time spent with children are two more important factors than parents' education level when raising children.

Recommendations

Recommendations for Family

Previous research (O'Brien & Bush, 1997) and the current study both have shown that family plays an important role in helping children establish healthy behaviors. The development of children's health behaviors at home mostly depends on the effectiveness of parents transmitting information about health behaviors to children (O'Brien & Bush, 1997). The transmission takes place most effectively in the context of an appropriate individual developmental level and a supportive family environment. The following recommendations are made accordingly.

Children's age and developmental stage

Though age was not a significant factor in the current study, it plays a crucial role in human development. Knowledge of developmental stages might help families handle children's behaviors, including dietary behaviors and physical activity, better. The epigenetic principle states that people develop through a predetermined unfolding of the personalities in eight stages shown in

Table 46 (Erikson, 1997). The children in the current study are judged to be in stage four or stage five; therefore, they were treated differently, during the data collection process according to their ability of understanding and responding to the survey (e.g. providing assistance to the younger children).

Stage four is called the latency stage, for the school-age child from about six to twelve. The task of the stage is to develop a capability for diligence while avoiding an unnecessary sense of inferiority (Erikson, 1997). Children must learn that there is pleasure not only in conceiving a plan, but in carrying it out. Moreover, they must learn the feeling of success, whether it is at home, in school or on the playground, academic or social (Erikson, 1997). Parents or family members, joined by teachers and peers, are expected to contribute to the children's development in different ways: parents must encourage, teachers must care, peers must accept. Though not common in the current study, the story of one little six-year old girl mentioned in one of the interviews is a good instance. This girl was teased about her weight, yet had not received any encouragement or help to deal with it from parents or teachers. Accordingly, her sense of inferiority developed, which made her choose to avoid contact with others and shut herself off to others. Developing children's competency, i.e., developing their right balance of diligence and inferiority, is recommended for this stage (Erikson, 1997). Parents can affect the health behaviors of children at this stage by providing them correct knowledge, emotional support and encouragement.

Table 46: The Eight Stages of the Epigenetic Principle

Stage (age)	Psychosocial crisis	Significant relations	Psychosocial modalities	Psychosocial virtues	Maladaptations & malignancies
I (0-1) – infant	Trust vs. mistrust	Mother	To get, to give in return	Hope, faith	Sensory distortion -- withdrawal
II (2-3) – toddler	Autonomy vs. shame and doubt	Parents	To hold on, to let go	Will, determination	Impulsivity -- compulsion
III (3-6) – preschooler	Initiative vs. guilt	Family	To go after, to play	Purpose, courage	Ruthlessness -- inhibition
IV (7-12 or so) -- school-age child	Industry vs. inferiority	Neighborhood and school	To complete, to make things together	Competence	Narrow virtuosity -- inertia
V (12-18 or so) – adolescence	Ego-identity vs. role-confusion	Peer groups, role models	To be oneself, to share oneself	Fidelity, loyalty	Fanaticism -- repudiation
VI (the 20's) – young adult	Intimacy vs. isolation	Partners, friends	To lose and find oneself in another	Love	Promiscuity -- exclusivity
VII (late 20's to 50's) – middle adult	Generativist vs. self-absorption	Household, workmates	To make be, to take care of	Care	Overextension -- rejectivity
VIII (50's and beyond) -- old adult	Integrity vs. despair	Mankind or any kind	To be, through having been, to face not being	Wisdom	Presumption -- despair

Source: Erikson, E. H. (1997). *The life cycle completed* (Edition Extended version with new chapters on the ninth stage of development by Joan M. Erikson ed.). New York: W.W. Norton.

Stage five is adolescence, beginning with puberty and ending around 18 or 20 years old. The task during adolescence is to achieve ego identity and avoid role confusion (Erikson, 1997). Ego identity indicates the ability of knowing who the person himself/herself is and how he/she fits into the rest of society(Erikson, 1997). It requires that the person takes all that he/she learned about life and himself/herself and mix it into a unified self-image (Erikson, 1997). Different from stage four, peer groups and role models have the significant relation at this stage. The interviews with the mothers of this study also indicated that peers' impact is becoming paramount to the adolescents. Regardless of the sex of the children, they intend to participate in activities with peers more than with parents. However, parents are still needed because the children are highly likely to encounter role confusion (Erikson, 1997). Society and family should have a mainstream adult culture that is worthy of the adolescent's respect, one with good adult role models and open lines of communication (Erikson, 1997). Communication, as one parent addressed in the interview, is the major recommended way for parents to influence the adolescents at this stage. Furthermore, caring adults can promote healthy peer interactions, which can prevent unhealthy behaviors among adolescents (Gougherty et al., 1992).

Parents' involvement

Parents must be physically available to children if they intend to provide positive influences on their children's lives. In some cases, parents may not be available to accompany their children, nor be able to provide useful information about health behavior due to busy schedules. It is recommended that parents use any helpful resource

such as other family members, e.g. grandparents , as shown in the current study, who could also influnce children positively, to take care of the children when needed.

Parents' involvement may vary according to parents' gender. For instance, being the main caregiver of the children, mothers spend more time with children. It is recommended that mothers pay more attention to children's energy balance and convey this information to children as well. Balance is the word used by the mothers in the current study several times in the interviews. Instead of solely controlling what children eat and how often they exercise, mothers should keep the balance between energy intake and energy expenditure. Fathers' roles have been confirmed in the interview with mothers. It might be useful to recommend that fathers address the importance of health behaviors in addition to academic performance in order to help children establish healthy habits.

Parents' involvement may also vary because of the specific health behavior. Physical activity may be the area suitable for parents to have influence on their children (O'Brien & Bush, 1997). It is reported that children's activity level was related to that of their parents (Moore et al., 1991). These observation suggest that families should share certain activities and that parents can serve as role models who give value and support to physical activity (O'Brien & Bush, 1997). When children grow, their request for independence and identity will make the family's ability to influence dietary behaviors harder. Parents or family members may feel that the ability to influence their children's eating is so limited, due to busy schedules, food preferences, or peer pressure. However, as one study suggested (Neumark-Sztainer, Wall, Perry, & Story, 2003), parents at least

can play an important role in influencing children's dietary behavior by increasing the availability of healthy foods at home and serving them at meals.

Recommendations for Health Promotion

Promoting healthy lifestyles is the goal of health behavior research. Unlike majority group children, Chinese-American children are in need of health promotion and health education programs that address different perspectives from their special cultural status. First of all, a program needs to enhance the healthier part of Chinese traditional culture into the education program materials, such as promoting consumption of more fresh vegetables and whole grains. Meanwhile, it should target the weaker part of their tradition, such as not addressing physical activity enough. Health professionals should promote health education programs within a Chinese-American cultural context, for instance, cooperating with Chinese-American organizations such as Chinese Weekend School to convey healthy lifestyle messages.

Second, a program should use the power of Chinese family norms, including having grandparents involved, as another source to promote healthy eating. Educating all the family members is crucial for such programs. The programs should deliver updated and accurate healthy diet messages to the family members before they can transmit it to the children. Bilingual materials and health professionals are highly recommended for older Chinese people.

Last, a program should address new immigrant children's self-efficacy, as they might have more obstacles to overcome in the new host country, which might influence their dietary behaviors and physical activity. Therefore, a program should help the children develop positive self-efficacy in the new lingual and cultural environment. The

relationship between self-efficacy and health behaviors is clear; therefore, the more important task for the health professional is to address how to improve children's self-efficacy. The development of self-efficacy is often influenced by four sources of information: performance accomplishments, vicarious experiences, verbal persuasive messages, and physiological signals (Bandura, 1986, 1997). Generally speaking, self-efficacy is enhanced when a person receives positive information through the above four sources. For example, a boy's physical activity self-efficacy is strengthened when he successfully performs a type of vigorous activity, observes another boy successfully perform the activity, receives positive praise from a parent or a teacher, and interprets bodily signals (e.g., increased heart and respiratory rates) as indicators of impending achievement of health. Therefore, health education or health promotion programs should emphasize the social environment in which the children can observe and learn positive behaviors, and hence, develop better self-efficacy.

Recommendations for Future Research

The findings of the current study support the results of previous research which indicated that SCT can be used to study behaviors and relevant factors. Overall, continued work is needed to learn how families affect the development of children's health behaviors. Familial patterns may influence children's future health beliefs, attitudes, and behaviors, and more longitudinal research is needed to understand possible causal relationships (O'Brien & Bush, 1997). In addition, it is a study with some limitations and can be improved in future research. The following recommendations are made for further research in order to adjust the limitations.

Instrumentation Related

Acculturation is too complex to be measured only by the questions included in the current study. An acculturation scale that is well developed and suitable for children is needed. It also should be a scale addressing the culture of the Chinese-American group.

The dietary knowledge session is not very suitable for Chinese children. Although the children may recognize the name of the food listed, the food is not representative of their daily diets, which comprise Chinese food as well as Western food. Therefore, a knowledge scale emphasizing Chinese children's regular food intake is needed.

Sample related

Snowball sampling restricts the representativeness of the current study since the participants were chosen based on referral. Random sampling or stratified sampling may be more informative if a population frame could be identified. The sample size of this study is small, and more children included in future research may provide more relevant information.

Data Collection Related

Some problem areas could be improved in future data collection. An interview-based 24-hour diet recall is recommended rather than the pen-and-paper recall form, in that detailed information and better understanding concerning children's eating habits may be achieved. Measured child's height and weight are recommended, instead of self-reported ones, in order to ensure accuracy.

In summary, future research, providing funding and supported by a research team, should employ a longitudinal design to better understand the interaction between personal

factors, environmental factors and behaviors over time. Ideally, for a small population group like Chinese-American children in this area, a study on the whole population is recommended. Otherwise, random sampling or stratified sampling is recommended if a population frame could be identified. In-depth interviews are recommended to complement what is lacking in the self-reported survey. More appropriate acculturation and dietary knowledge scales are recommended for the Chinese population, especially for the children, considering their cultural background.

Conclusion

This study provides information concerning the health behaviors of Chinese American children, which may help to fill in gaps in this field. The findings of this study may be used as baseline information to address obesity prevention and to develop health behavior education programs in the Chinese population. In the U.S., this study also calls for more attention to be paid to the small minority group of Chinese-Americans and to the role of its own culture and norms. Public health is not completed without eliminating racial and ethnic health disparities, and as such should address the needs of all people in minority groups as well as those in the majority group. Every citizen counts. The late President Franklin Delano Roosevelt put it well (Office of Minority Health, 2004),

> *The success or failure of any government in the final analysis must be measured by the well-being of its citizens. Nothing can be more important to a state than its public health; the state's paramount concern should be the health of its people.*

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APPENDIXES

Appendix A: Approval Letter

Saturday, April 12, 2003

Zhang, Yan
College of Health Sciences,
Spong Hall Room # 207
Old Dominion University
Norfolk, VA, 23529
U. S. A.

张雁
老领地大学健康科学学院思庞楼 207 室
弗吉尼亚州诺福克市, 邮编: 23529
美国

Dear Ms. Zhang,

In response to your request of collecting data of children's lifestyle, I have discussed with related teachers and our leaders board, and we decided to give you permission of collecting data for you dissertation research in our school in 2003. The teachers and students in our school will provide help to you.

尊敬的张女士:

就您所提得的搜集儿童生活方式 (饮食习惯和体力活动)的要求, 经与相关教师和领导层讨论后, 我们决定允许您于 2003 年间在我校为您的论文研究收集数据. 我校的教师和学生会提供相关的帮助.

Best wishes,

此致

敬礼

Sincerely,

(校长名字, 学校名字)
TIDEWATER CHINESE SCHOOL

Appendix B: Health Behavior Questionnaire

Date

__ __ / __ __ / __ __ __ __ mm / dd / yyyy

This survey is about health behavior. It has been developed so you can tell us what you do that may affect your health. The information you give will be used to develop better health education for young people like yourself. DO NOT write your name on this survey. The answers you give will be kept private. No one will know what you write. Answer the questions based on what you really do.

Completing the survey is voluntary. Whether or not you answer the questions will not affect your grade in your class. If you are not comfortable answering a question, just leave it blank.

The questions that ask about your background will be used only to describe the types of children completing this survey. The information will not be used to find out your name. No names will ever be reported.

Make sure to read every question and answer the best you can.

Section 1: Tell Us About Yourself

D1. How old are you?

— —

D2. Are you a boy or a girl? (Choose one)

1 Boy

2 Girl

D3. Which grade are you in the regular school?

— — — — —

D4. What is your birth order? (Choose one)

1 I don't have brother or sister

2 I am the oldest child

3 I am a middle child

4 I am the youngest child.

D5. How tall are you?

— — —

D6. How much do you weigh?

— — —

D7. Are you attending the Chinese weekend school?

1 Yes

0 No

D8. Which language do you speak most of the time at home?

1 Chinese

2 English

3 Other

D9. Where were you born?

1 Mainland China

2 Hong Kong

3 Taiwan

4 The United States of American

5 Other Asian Countries

D10. Is your mother a Chinese?

1 Yes

0 No

D11. Is your father a Chinese?

1 Yes

0 No

D12. Which language do you prefer when you read?

1 Chinese

2 English

3 Other

D13. Which language do you prefer when you get with your Chinese friends ?

1 Chinese

2 English

3 Other

D14. How many years have you been in the U.S.?

— —

Section 2: Tell Us About Your Surrounding.

EP1. Is fast food, such as potato chips, candy, and cookies always available in your home?

1 Yes
0 No

EP2. Is fruit always available for you as a snack in your home?

1 Yes
0 No

EP3. How close is the nearest recreation center to your home? (Choose one)

1 I can walk there
2 I can ride a bicycle to get there
3 My parent has to drive me there.
4 I never go

EP4. How close is the nearest playground to your home? (Choose one)

1 I can walk there
2 I can ride a bicycle to get there
3 My parent has to drive me there.
4 I never go

EP5. How do you evaluate the safety of your neighborhood? (Choose one)

1 Unsafe at all
2 A little bit unsafe
3 Somehow unsafe
4 Somehow safe
5 Very safe

EP6. Who do you mainly live with? (Circle all apply)

1 Mother
2 Father
3 Sister(s)
4 Brother(s)
5 Grandparent(s)
6 Other

EP7. How many people do you live with (do NOT count yourself)? ___ ___

EP8. Who is there when you get home after school? (Circle all apply)

1 Mother
2 Father
3 Sister(s)
4 Brother(s)
5 Grandparent(s)
6 Someone else

EP9. Who usually takes you outside to play? (Choose one)

1 I don't go outside to play
2 Nobody, I play outside by myself
3 My mother
4 My father
5 My grandparent(s)
6 Someone else

EP10. What is the highest education degree your mother has? (Choose one)

1 Less than high school
2 High school
3 College or above

EP11. What is the highest education degree your father has? (Choose one)

1 Less than high school
2 High school
3 College or above

EP12. How do you get your lunch on school days? (Choose one)

1 I fix lunch by myself
2 My parent fixes lunch for me
3 My parents give me money to buy lunch at school cafeteria
6 I eat lunch at school cafeteria for free
7 I go to fast food restaurant like McDonald's to eat lunch.

Section 3: Which Food is Better for Your Health?

Circle one of the two foods that you think is better for your health.

DK1.	Bread (Choose one)			
	1	Whole wheat bread	2	White bread
DK2.	Meat (Choose one)			
	1	Broiled beef	2	Broiled fish
DK3.	Breakfast (Choose one)			
	1	Cold cereal	2	Eggs and bacon
DK4.	Protein (Choose one)			
	1	Beef	2	Beans
DK5.	Chicken or Hamburger (Choose one)			
	1	Chicken	2	Hamburger
DK6.	Milk (Choose one)			
	1	Regular milk	2	Low fat or skim milk
DK7.	Peanut butter or Bologna (Choose one)			
	1	Peanut butter	2	Bologna
DK8.	Frozen yogurt or Ice cream (Choose one)			
	1	Frozen yogurt	2	Ice cream
DK9.	Salad or Fries (Choose one)			
	1	Green salad	2	French fries
DK10.	Raisins or Candy (Choose one)			
	1	Raisins	2	Candy bar
DK11.	Corn (Choose one)			
	1	Frozen corn	2	Canned corn
DK12.	Potato (Choose one)			
	1	French fries	2	Baked potato
DK13.	Peanut butter (Choose one)			
	1	Regular peanut butter	2	Freshly ground peanut butter

Section 4: 24-Hour Diet Recall Form

Please tell us what you ate yesterday. For example, if you ate one egg and drank a cup of apple juice at home yesterday morning for breakfast, you need to fill out the form as follows. An example of how to fill it out is in gray. We have two pages for this form to make sure you have enough space to write. Thank you.

Time of Day	**Foods and Beverages Consumed (What did you eat and drink?)**				
Hour A-Morning N-Noon P-Afternoon/evening M-Midnight	Meal BRE-Breakfast BRU-Brunch LUN-Lunch DIN-Dinner SNA-Snack	Place COM-Community feeding program Day-Day care FRI-friend's/someone's house HOM-home OTH-other RES-restaurant SCH-school STO-store WOR-work	Food	Description	Amount t-teaspoons T-Tablespoons C-cups Oz-Ounces Sm-Small serving (unit) L-Large Serving (unit)
A	BRE	HOM	Egg	Boiled egg	1
A	BRE	HOM	Juice	Apple Juice	1 cup

Time of Day	**Foods and Beverages Consumed (What did you eat and drink?)**				
Hour A-Morning N-Noon P-Afternoon/evening M-Midnight	Meal BRE-Breakfast BRU-Brunch LUN-Lunch DIN-Dinner SNA-Snack	Place COM-Community feeding program Day-Day care FRI-friend's/someone's house HOM-home OTH-other RES-restaurant SCH-school STO-store WOR-work	Food	Description	Amount t-teaspoons T-Tablespoons C-cups Oz-Ounces Sm-Small serving (unit) L-Large Serving (unit)

Section 5: Tell Us What You Have Eaten in the Past 7 Days

DB1. During the past 7 days, how many times did you drink 100% fruit juices such as orange juice, apple juice, or grape juice? (Do not count punch, Kool-Aid, sports drinks, or other fruit-flavored drinks.) (Choose one)

1 I did not drink 100% fruit juice during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB2. During the past 7 days, how many times did you eat fruit? (Do not count fruit juice.) (Choose one)

1 I did not eat fruit during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB3. During the past 7 days, how many times did you eat green salad? (Choose one)

1 I did not eat green salad during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB4. During the past 7 days, how many times did you eat potatoes? (Do not count French fries, fried potatoes, or potato chips.) (Choose one)

1 I did not eat them during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB5. During the past 7 days, how many times did you eat carrots? (Choose one)

1 I did not eat them during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB6. During the past 7 days, how many times did you eat other vegetables? (Do not count green salad, potatoes, or carrots.) (Choose one)

1 I did not eat them during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB7. During the past 7 days, how many glasses of milk did you drink? (Include the milk you drank in a glass or cup, from a carton, or with cereal. Count the half pint of milk served at school as equal to one glass.) (Choose one)

1 I did not drink milk during the past 7 days
2 1 to 3 glasses during the past 7 days
3 4 to 6 glasses during the past 7 days
4 1 glass per day
5 2 glasses per day
6 3 glasses per day
7 4 or more glasses per day

DB8. During the past 7 days, how many times did you eat rice? (Choose one)

1 I did not eat them during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB9. During the past 7 days, how many times did you eat Tofu? (Choose one)

1 I did not eat them during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB10. During the past 7 days, how many times did you eat French fries, fried potatoes, or potato chips? (Choose one)

1 I did not eat them during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB11. During the past 7 days, how many times did you eat ice cream or milkshakes? (Choose one)

1 I did not eat them during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB12. During the past 7 days, how many times did you eat candy or cookies? (Choose one)

1 I did not eat them during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

DB13. During the past 7 days, how many times did you drink soda (either diet or regular)? (Choose one)

1 I did not drink them during the past 7 days
2 1 to 3 times during the past 7 days
3 4 to 6 times during the past 7 days
4 1 time per day
5 2 times per day
6 3 times per day
7 4 or more times per day

Section 6: How Sure Are You About Your Food Choices?

The questions in this section ask how sure you are about being able to eat some of the foods below. Please answer by circling either NOT Sure, A Little Sure, or Very Sure for each questions.

DSE1. How sure are you that you can eat food without adding salt from a shaker? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE2. How sure are you that you can eat fresh or frozen vegetables instead of canned vegetables? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE3. How sure are you that you can ask you parents for popcorn without salt and butter? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE4. How sure are you that you can ask for lettuce and tomato instead of pickles on your hamburger? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE5. How sure are you that you can drink low fat white milk instead of regular white milk? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE6. How sure are you that you can eat cereal instead of a donut? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE7. How sure are you that you can eat fresh fruit instead of a candy bar? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE8. How sure are you that you can eat toast with no spread instead of with margarine/butter? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE9. How sure are you that you can take the skin off chicken (and not eat the skin)? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE10. How sure are you that you can ask for frozen yogurt instead of ice cream? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE11. How sure are you that you can ask your parents to buy bread sticks instead of salted crackers? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE12. How sure are you that you can eat a baked potato instead of French fries? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE13. How sure are you that you can drink fruit juice instead of a soft drink (soda pop)? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE14. How sure are you that you can eat cooked vegetables without adding real butter to them? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

DSE15. How sure you are that you can eat a salad from the salad bar at a fast food restaurant instead of ordering a hamburger and fries? (Choose one)

1 Not Sure

2 A little Sure

3 Very Sure

Section 7: About Food: What Do Other People Want You To Eat?

Check the one you would answer yes. For example, you think your parent would like you to eat vegetables, check parents; if you think you teacher and friends would like you to eat vegetables too, check them as well. If you don't think they do so, just leave it blank.

DR1. Who wants you to eat popcorn without salt and butter on it? (Check all that apply)

__ Your parents
__ Your teachers
__ Your friends

DR2. Who wants you to eat lots of fruits and vegetables? (Check all that apply)

__ Your parents
__ Your teachers
__ Your friends

DR3. Who wants you to eat food without putting salt on it from the salt shaker? (Check all that apply)

__ Your parents
__ Your teachers
__ Your friends

DR4. Who wants you to drink skim or low fat milk instead of whole milk? (Check all that apply)

__ Your parents
__ Your teachers
__ Your friends

DR5. Who wants you to eat bread with no spread instead of with margarine/butter? (Check all that apply)

__ Your parents
__ Your teachers
__ Your friends

DR6. Who wants you to eat the chicken meat without the skin? (Check all that apply)

__ Your parents
__ Your teachers
__ Your friends

DR7. Who wants you to eat a salad from the salad bar instead of eating a hamburger? (Check all that apply)

__ Your parents
__ Your teachers
__ Your friends

Section 8: Tell Us About Your Physical Activity

PA1. On how many of the past 7 days did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities? (Choose one)

0	0 day
1	1 day
2	2 days
3	3 days
4	4 days
5	5 days
6	6 days
7	7 days

PA2. On how many of the past 7 days did you participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors? (Choose one)

0	0 day
1	1 day
2	2 days
3	3 days
4	4 days
5	5 days
6	6 days
7	7 days

PA3. On how many of the past 7 days did you do exercises to strengthen or tone your muscles, such as push-ups, sit-ups, or weight lifting? (Choose one)

0	0 day
1	1 day
2	2 days
3	3 days
4	4 days
5	5 days
6	6 days
7	7 days

PA4. On an average school day, how many hours do you watch TV, play on the computer or play video games? (Choose one)

1 I do not watch TV, play on computer or play video games on an average school day

2 Less than 1 hour per day

3 1 hour per day

4 2 hours per day

5 3 hours per day

6 4 hours per day

7 5 or more hours per day

PA5. In an average week when you are in school, on how many days do you go to physical education (PE) classes? (Choose one)

0 0 day

1 1 day

2 2 days

3 3 days

4 4 days

5 5 days

PA6. During an average physical education (PE) class, how many minutes do you spend actually exercising or playing sports? (Choose one)

1 I do not take PE

2 Less than 10 minutes

3 10 to 20 minutes

4 21 to 30 minutes

5 31 to 40 minutes

6 41 to 50 minutes

7 51 to 60 minutes

8 More than 60 minutes

PA7. During the past 12 months, on how many sports teams did you play? (Include any teams run by your school or community groups.) (Choose one)

0 0 team

1 1 team

2 2 teams

3 3 or more teams

Section 9: Physical Activity- Social Support

The questions in this section ask about physical activity. Please answer by circling either YES or No for each question. NOTE being physical active means doing exercises like running, jogging, walking fast, bike riding, dancing, skating, or any other activity that makes your breathe faster and your heart beat faster.

PSS1. One or both of my parents are physically active. They do exercises like running, jogging, walking fast, bike riding, swimming, dancing, or skating.

1 Yes

0 No

PSS2. One or both of my parents do exercises with me like running, jogging, walking fast, bike riding, swimming, dancing, or skating.

1 Yes

0 No

PSS3. Most of my friends are physically active.

1 Yes

0 No

PSS4. Most of my teachers are physically active.

1 Yes

0 No

PSS5. Most of my friends want me to be physically active when we play.

1 Yes

0 No

PSS6. My friends and I have fun when we are physically active playing together.

1 Yes

0 No

PSS7. One or both of my parents want me to stay inside when I want to be physically active outside.

1 Yes

0 No

PSS8. One or both my parents will not let me do physically activities when I want to.

1 Yes

0 No

PSS9. One or both of my parents like to watch me when I am being physically active.

1 Yes

0 No

PSS10. When I am physically active, one or both of my parents smile and cheer for me.

1 Yes
0 No

PSS11. Most of my classroom teachers criticize people who exercise.

1 Yes
0 No

PSS12. When I am physically active at recess, most of my classroom teachers tell me to stop.

1 Yes
0 No

PSS13. When I am physically active in PE class, my PE teacher tells me I am doing a good job.

1 Yes
0 No

PSS14. Most of my friends tease me a lot when I am physically active.

1 Yes
0 No

PSS15. When doing sports, most of my classmates choose me last for their team.

1 Yes
0 No

PSS16. When I am physically active, most of my friends make fun of me.

1 Yes
0 No

PSS17. When I am physically active, most of my friends tell me I am a good player.

1 Yes
0 No

PSS18. When doing sports most of my classmates want me on their team.

1 Yes
0 No

Section 10: Physical Activity- How Sure Are You?

The questions in this section ask how sure you are about being physically active. Please answer by circling either NOT sure, A little sure, or Very Sure for each question.

PSE1. How sure are you that you can choose jogging during recess? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

PSE2. How sure are you that you can be physically active 3-5 times a week? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

PSE3. How sure are you that you can exercise and keep moving most of the time in physical education class? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

PSE4. How sure are you that you can improve your physical fitness by running or biking 3-5 times a week? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

PSE5. How sure are you that you can keep up a steady pace without stopping for 15-20 minutes when you are physically active? (Choose one)

1 Not Sure
2 A little Sure
3 Very Sure

That is all of the questions. Thank you for answering these questions.

Appendix C: Interview Protocol With Chinese Children's Parents

Place: Place that the parents feel comfortable
Time:
Participant role: Mother__, Father__,
# of child(ren): Children's age (gender):
Interviewers: Yan Zhang and Hongyun Fu
Interview Language: Chinese and/or English, whichever is appropriate for the parents

Introduction: Thank you for taking the time to sit with me. I would like to talk with you about your child(ren)'s health behaviors such as eating behaviors and physical activity. In addition to discussing what you know about their behaviors, I'm also curious to know what you think about their behaviors and what your concerns are. I have some broad discussion questions for you, but you are welcome to share all your thoughts on this process and what you're feeling, even if it seems not directly related to the issues. The interview will be audio-taped and transcribed later, and I will be analyzing it to learn about your views on these issues.

1. What do you think most influences your child(ren)'s diet and physical activity?
   a. Culture?
   b. Knowledge?
   c. Self-efficacy (Self-confidence)?
   d. Physical Environment?
      i. Availability?
      ii. Family members (Grandparents)?
      iii. Your education?
   e. Social environment, such as support from you and the teacher or their friends?

2. What is your major concern about your child(ren)'s eating and physical activity?
   a. Do you know about the food pyramid? What do you think about it?
   b. How often do you take your children to fast food restaurant such as McDonald?

3. What do your children usually eat?
   a. Do you think your child(ren) eat healthy?
   b. What do you think it is a good diet for your child(ren)?
   c. What do you think it is a bad diet for your child(ren)?

4. What do they usually do for exercise?
   a. Do you think your child(ren) get enough exercise?
   b. What do you think it is a good exercise plan for your child(ren)?

5. What do you think you can do to help with your child(ren)'s eating and physical activity the most?

Thanks for your participating and sharing your insight with me.

VITA

Yan Zhang

EDUCATION:

2005 Doctoral Degree of Philosophy, Health Services Research
School of Community and Environmental Health, Spong Hall Room #204
College of Health Sciences, Old Dominion University, Norfolk, VA 23529

1999 Master Degree of Medicine, Acupuncture
China Academy of Traditional Chinese Medicine, Beijing, P.R. China

1996 Bachelor Degree of Medicine, Traditional Chinese Medicine & Acupuncture
Beijing University of Traditional Chinese Medicine and Pharmacy, P.R. China

EXPERIENCE:

2005-Date Project Director, Girls On The Run Program, Williamsburg, VA

2004- Date Adjunct Instructor, MEDT 440-Clinical Research Methods
College of Health Science, Old Dominion University, Norfolk, VA

SELECTED PRESENTATIONS:

Zhang Y., Plichta S., Houseman C., Garzon L. "Using Social Cognitive Theory to Model Health Behaviors Among Chinese-American Children", poster presentation at the 5th Annual Meeting of the American Academy of Health Behavior in Charleston, SC, February 20-23, 2005.

Zhang Y., Tweed S., Plichta S. "Maintaining and Improving Good Health Behaviors in High Risk Adolescent Girls", poster presentation at the 5th Annual Meeting of the American Academy of Health Behavior in Charleston, SC, February 20-23, 2005.

PAPER:

Zhang Y., Plichta S., Houseman C., Garzon L. "Using Social Cognitive Theory to Model Health Behaviors Among Chinese-American Children" *Journal of Urban Health.* 2005 June (Abstract)

Zhang Y., Tweed S., Plichta S. "Maintaining and Improving Good Health Behaviors in High Risk Adolescent Girls" *Journal of Urban Health.* 2005 June (Abstract)

Plichta S.B., Houseman C., Goodman J.S., **Zhang Y**. "Training Elementary School Personnel to Detect and Prevent Child Sexual Abuse: What do they want to know?" *Journal of Urban Health.* 2003; v80 (supplement 2): ii45.

Zhang Y., Plichta S., Houseman C., Garzon L., DeBate R. "Exploration of Social Cognitive Factors Influencing the Adoption of Health Behaviors Among Chinese-American Children" in the review of *Journal of Immigrant Health*

Plichta S., Vandecar-Burdin, Odor R., Reams S., **Zhang Y.,** "The Emergency Department and Victims of Sexual Violence: An Assessment of Preparedness to Help" accepted by *Journal of Health and Human Services Administration*